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GROWTH, AGE, AND SIZE AT MATURITY OF TANNER CRAB, *Chionoecetes bairdi*, IN THE NORTHERN GULF OF ALASKA

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ABSTRACT

In this paper we develop estimates of growth, age at size, and size at sexual maturity for the Tanner crab, *Chionoecetes bairdi*, utilizing observed modes from size frequency distributions and measured growth of molting crabs.

Growth per molt decreases after sexual maturity for males at an average size of 110 - 115 mm carapace width. Females undergo a terminal molt to maturity at an average size of 83 mm carapace width. Growth is significantly less for females molting to maturity than for males at the same size ($\alpha = .05$) but there is no significant difference ($\alpha = .05$) between juveniles of either sex. Growth per molt of males in this study was not significantly different ($\alpha = .025$) between years. A proposed growth-age relationship predicts that females molt to maturity at about age five, while males become mature at about six years of age. Recruitment to the male only fishery occurs at seven to eight years. Even the largest commercially caught males are probably no older than twelve to fifteen years.

INTRODUCTION

Crustacean growth can be considered as a product of the size increment gained at ecdysis (molt) and the frequency of ecdysis. Knowledge of growth, size-age relationships, and the size at maturity for the Tanner crab, *Chionoecetes bairdi*, is essential for the scientific management of this species.

Studying growth in C. *bairdi* is complicated because as with all crustaceans C. *bairdi* does not contain any growth ring structures.

In this paper, we develop estimates of growth, age at size, and size at sexual maturity for Tanner crab in the Northern Gulf of Alaska. These estimates are based upon observed growth and modal groups evident in size frequency distributions taken at various points in time and location. Some of the size frequency distributions were derived from trawl and pot surveys not directly related to this study. Therefore, size frequencies were compiled at irregular intervals. However, for each sample, definite patterns in modal values exist.

We were able to field proof growth and molt frequency predicted from our modal by a time series of repetitive samples from a single population of small crab.

METHODS AND MATERIALS

Molt Frequency

Molt frequency was estimated and field proofed from the progression of dominant modes through a series of size frequency histograms.

Crab samples were collected from trawl nets, commercial crab pots, fish stomachs, and by scuba divers. Trawling was conducted in four locations: (1) Prince William Sound in 1971, 1972, and 1973; (2) the Northern Gulf of Alaska between Montague Island and Cape St. Elias in August 1973 and July 1976; (3) offshore Kodiak Island in July 1975 and 1976; and (4) Women's Bay, Kodiak on 3 December 1979 (Figure 1). The trawling in Prince William Sound used a 4.9 m (16 ft) tri-net with 19 mm (0.75 in) mesh net for the codend. Trawling offshore Kodiak and the Northern Gulf of Alaska took place on an International Pacific Halibut Commission (IPHC) trawl survey using a 28.6 m (94 ft) otter trawl with 89 mm (3.5 in) mesh net for the codend. Trawling in Women's Bay was accomplished with a 400 Eastern otter trawl with a small mesh liner in the codend. Size frequency of commercial size males was determined by sampling the commercial harvest in Kodiak. Tanner crab less than 30 mm carapace width (CW) were collected from the stomachs of Pacific cod (*Gadus macrocephalus*) and also from tom cod (*Microgadus proximus*) and halibut (*Hippoglossus stenolepis*). Scuba divers collected small crab in Women's Bay, Kodiak between 26 October 1978 and 4 May 1979 at depths to 18 meters (60 ft).

For all samples crabs were sexed and carapace width measurements were taken to the nearest 0.1 mm for crabs less than 40 mm CW. Larger crabs were measured to the nearest mm.

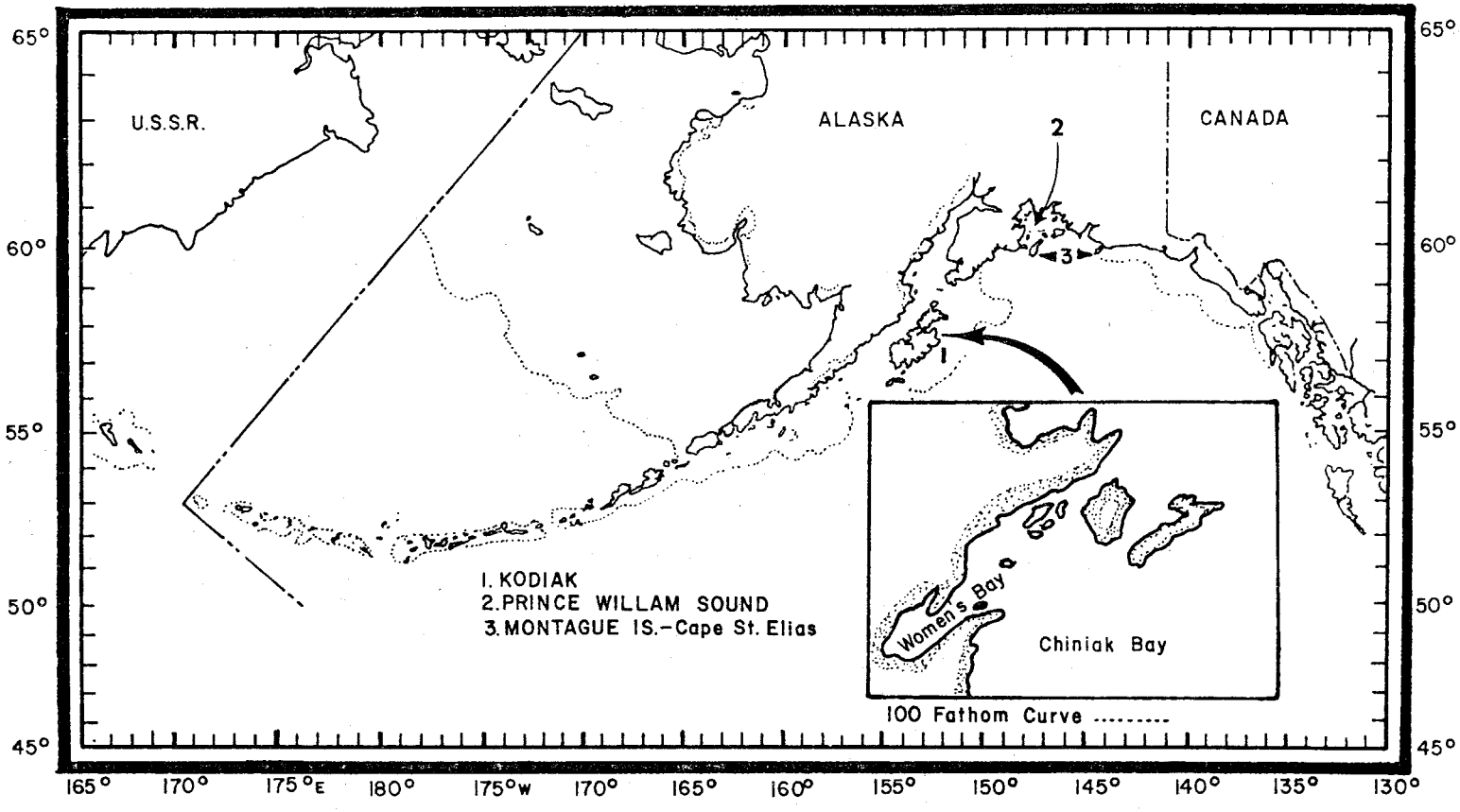

FIGURE 1. Locations of observations on the growth, age, and size at maturity of the Tanner Crab, *Chionoecetes bairdi*.

Growth Per Molt

Growth increment per molt data was obtained by measuring crabs before and after molting. Crabs preparing to molt were collected by scuba divers at depths to 23 m (75 ft) in Women's Bay and Chiniak Bay, Kodiak Island from November 1973 through November 1977 (Figure 1). Crabs larger than 40 mm CW were immediately placed in 1 m x 1 m x 0.5 m holding pens; crabs smaller than 40 mm CW were placed in perforated 1 quart plastic containers which were then placed into the larger holding pens. All crabs were held at the same depth and approximate location as their capture until completion of ecdysis or a maximum of 7 days. No crabs were fed during the holding period.

Growth per molt was determined after molting by measuring the greatest CW (excluding spines) of the cast exoskeleton and the newshell crab which had been allowed to harden for 24 hours. Crabs missing more than three limbs prior to molting were not included in the analysis. All measurements were made to the nearest millimeter.

Incremental growth is analyzed according to the Hiatt (1948) method of fitting a least squares regression line using premolt carapace width as the independent variable and postmolt carapace width as the dependent variable. Hiatt plots were tested for the presence of inflection points by a technique described by Somerton (1978).

Following the Somerton technique, incremental growth data were divided into two groups by a cutoff point moving sequentially from the smallest to largest premolt width in 1 mm increments. Estimates of the slope and intercept of the two lines were obtained using linear regression. The cutoff point yielding two groups with the lowest pooled residual sum of squares for the two lines was significantly (α = .05) lower than the residual sum of squares for a single line fit to all the data. Covariance analysis was performed to test for the equality of the regression parameters between juvenile male and juvenile female growth since our data base for juvenile females was small.

Size at Maturity

Size at 50% maturity for females was determined by regressing CW on the percent of mature females (Watson 1969; Hilsinger 1976). The size at which the ovary matures was determined by the same method using percent of juvenile females with orange ovary as the dependent variable.

Size of males at maturity was taken from existing literature (Brown and Powell 1972; Somerton 1978).

Age Determination

In an attempt to estimate age, the calculated instar sizes were superimposed on carapace width frequency distributions on the assumption that recognizable size groups observed in collections of juvenile crab correspond to annual cohorts. Such cohorts were assigned for groups averaging up to 56 mm in width. The resulting relationship was extended linearly over the range of sizes observed in the population.

RESULTS

Molt Frequency

Size frequency distributions for juvenile Tanner crabs collected during January, April, May, June, July, and August in Prince William Sound, the Northern Gulf of Alaska adjacent to Prince William Sound, and offshore Kodiak Island all exhibited well defined and usually discrete size classes (Hilsinger, Donaldson, and Cooney 1975).

In Prince William Sound modes appeared at 11 mm, 27 mm, and 37 mm CW in January and at 14 mm in April (Table 1). In May through June the primary mode was at 18 mm while in August modes occurred at 12 mm, 19 mm, 27 mm, and 38 mm. Modes at 85 mm and 105 mm were evident in July sampling in 1976.

In the Northern Gulf of Alaska, modes appeared at 40 mm and 54 mm in August. Samples of Tanner crabs from fish stomachs in July showed modes at 8 mm, 12 mm, 17 mm, and 24 mm. In all stomach samples in which males and females were separated, the modes appeared at the same sizes.

Size frequency distributions for crabs collected in trawls near Kodiak Island in 1975 contained modes at 58 mm for males and 60 mm for females.

Above 60 mm, juvenile females clustered at 83 mm while the male size frequency blended into one large undifferentiated group between 60 mm and 110 mm.

Females having undergone their terminal molt averaged 94 mm in Kodiak waters while adult males from the Kodiak commercial fishery averaged 141 mm, 156 mm, and 155 mm in 1976, 1977, and 1978, respectively.

On 26 October 1978 a population of Tanner crab was located on mud substrate at a depth of about 18 m (60 ft) in Women's Bay, Kodiak. Six consecutive scuba dives extending to 4 May 1979 were made on this population. A total of 1,615 crab 9 - 45 mm in CW were collected. Modes occurred at 14 mm in October and 18 to 24 mm in January and March. A predominant mode in April occurred at 24 mm. The start of a new modal group at about 33 mm CW is evident in April while a previous strong mode at 18 mm is greatly reduced. Scuba sampling in May showed modes at 24 and about 33 mm CW (Table 1 and Figure 2).

The same population was sampled by trawl in December of 1979. A total of 679 male and female Tanner crab ranging from 18 mm to 158 mm CW was collected from seven tows. Prominent modes occurred at 41 mm and 53 mm CW (Table 1 and Figure 2).

Growth Per Molt

A total of 371 male Tanner crab with a premolt carapace width between 12 and 137 mm as well as 98 females between 12 mm and 93 mm molted in a manner described by Watson (1971) for *C. opilio*. Records were grouped by 10 mm intervals and are summarized in Tables 2 and 3 and presented in its entirety in Appendix Tables 1 and 2. Absolute and percentage increments for males are graphed in Figure 3. Absolute growth per molt increases with size among male Tanner crabs while percent growth decreases with size. Crabs between 10 mm and 19 mm CW grew an average of 32.5% while those between 120 mm and 129 mm increased in size by an average of 20.7% (Table 2). Females

Table 1. Position of *Chionoecetes bairdi* modes in size frequency distributions.

Date	Geographic area	Collection method	Location of modes (mm carapace width)
August 1971	Prince William Sound	trawl	12, 19, 27, 38
April 1972	Prince William Sound	trawl	14
May-June 1972	Prince William Sound	trawl	18
January 1973	Prince William Sound	trawl	11, 27, 37
August 1973	Northern Gulf of Alaska	trawl	40, 54
July 1975	Kodiak	fish stomach	8, 12, 17, 24
July 1975	Kodiak	trawl	58, 60, 83
July 1976	Prince William Sound	trawl	85, 105
October 1978	Kodiak	scuba	14
January 1979	Kodiak	scuba	18, 24
March 1979	Kodiak	scuba	18, 24
April 1979	Kodiak	scuba	24, 33
May 1979	Kodiak	scuba	24, 33
December 1979	Kodiak	trawl	41, 53

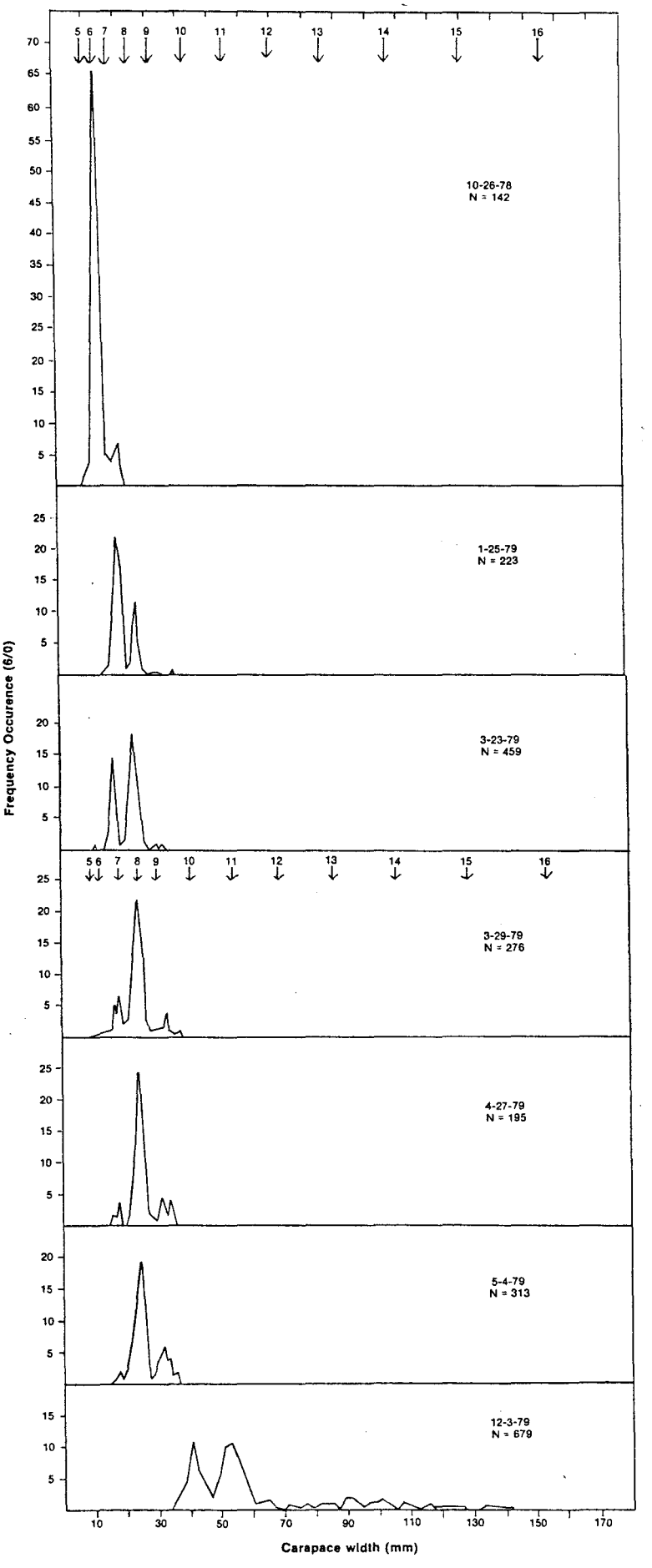

Figure 2. Carapace width frequency distributions of male and female *Chionoecetes bairdi* collected in Women's Bay, Kodiak, Alaska. Arrows represent positions of calculated instars.

Table 2. Average incremental growth for male *Chionoecetes bairdi* molting in holding pens; 95% confidence limits included 3 January 1974 to 25 November 1977.

Size Group (mm)	n	Carapace width, mm		Growth, mm	
		x pre	y post	y - x	y - x%
10 - 19	21	17.7 ± 4.4	23.5 ± 5.5	5.7 ± 1.4	32.5 ± 7.9
20 - 29	2	23.2 ± 8.9	30.6 ± 11.3	7.4 ± 2.5	31.9 ± 1.5
30 - 39	7	38.0 ± 2.0	50.0 ± 3.3	12.0 ± 2.9	31.6 ± 8.2
40 - 49	10	42.5 ± 4.8	54.0 ± 4.6	11.5 ± 2.1	27.1 ± 6.2
50 - 59	5	57.4 ± 2.6	72.2 ± 5.1	14.8 ± 3.4	25.8 ± 5.4
60 - 69	40	65.3 ± 5.0	81.7 ± 7.1	16.3 ± 3.6	25.0 ± 5.4
70 - 79	25	73.5 ± 5.2	91.4 ± 6.6	17.8 ± 4.5	24.1 ± 5.4
80 - 86	29	83.5 ± 3.6	102.8 ± 6.0	19.3 ± 5.4	22.8 ± 6.4
87 - 89	18	87.8 ± 1.5	108.9 ± 6.2	21.1 ± 6.5	23.7 ± 7.7
90 - 99	93	94.4 ± 5.6	116.7 ± 8.8	22.0 ± 8.0	23.8 ± 6.4
100 - 109	50	104.6 ± 5.6	127.6 ± 7.0	22.9 ± 4.8	22.0 ± 4.5
110 - 119	48	114.0 ± 5.3	138.2 ± 7.6	24.2 ± 4.5	21.1 ± 3.8
120 - 129	21	123.0 ± 5.2	148.6 ± 7.1	25.6 ± 4.4	20.7 ± 3.6
130 - 139	2	133.5 ± 9.7	154.5 ± 4.2	21.0 ± 5.5	15.7 ± 5.3
	371				

Table 3. Average incremental growth for juvenile female *Chionoecetes bairdi* molting and remaining juvenile and molting to maturity; 95% confidence limits included, 4 February 1974 - 12 December 1977.

Size Group (mm)	n	Carapace width, mm		Growth, mm	
		x pre	y post	y - x	y - x%
10 - 19	11	17.4 ± 4.6	23.1 ± 6.5	5.8 ± 1.9	32.9 ± 4.2
20 - 29	2	20.5 ± 1.0	27.3 ± 0.8	6.6 ± 0.7	31.8 ± 4.8
30 - 39	6	38.0 ± 3.1	49.5 ± 3.6	11.5 ± 1.9	30.2 ± 5.4
40 - 49	8	43.6 ± 6.1	56.6 ± 6.2	13.0 ± 1.5	29.9 ± 5.3
50 - 59	1	56.0	73.0	17.0	30.3
60 - 69	14	64.4 ± 6.0	82.2 ± 6.7	17.7 ± 3.4	27.6 ± 6.2
60 - 69 a/	4	68.0 ± 2.8	82.2 ± 2.5	14.2 ± 4.9	20.9 ± 8.1
70 - 79	7	72.1 ± 3.8	90.4 ± 4.4	18.2 ± 4.2	25.3 ± 6.4
70 - 70 a/	19	75.2 ± 4.4	89.8 ± 5.8	14.6 ± 4.8	19.4 ± 6.5
80 - 89	20	84.1 ± 6.6	98.3 ± 6.9	14.2 ± 2.9	16.8 ± 3.8
90 - 99	6	91.8 ± 1.5	105.8 ± 4.2	14.0 ± 3.5	15.1 ± 3.8
	98				

a/ Molting to maturity

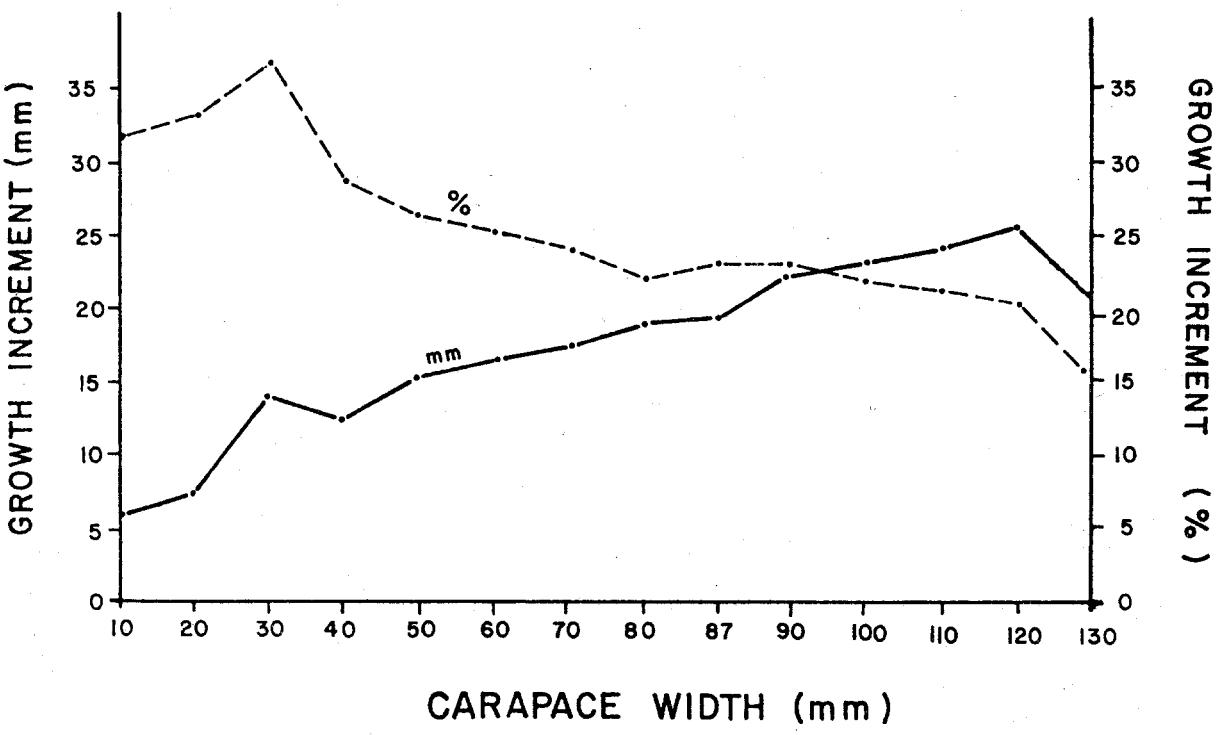

Figure 3. Absolute and percentage increments at molting for male *Chionoecetes bairdi*

show similar growth trends to the males. The 10 mm to 19 mm group increased by 32.9% (Table 2). Females molting to maturity increased in size by a significantly smaller amount than similar size females remaining juvenile. For example, in the 60 mm to 69 mm class, crabs molting to maturity increased in size by an average of 20.9% while those remaining as juveniles after the molt grew 27.6% (Table 3).

Determination of Instar Sizes

Growth per molt data by sex were plotted by Hiatt's (1948) method (Figures 4 and 5). Analysis of covariance of the regression lines showed no significant differences (α = .025) in growth between the 3 years. Therefore, all 3 years' data were combined by sex. Growth equations generated where y is carapace width in mm after molting, x is the same before molting, and a and b are fitted constants are:

1) male and female instars 2 - 10: ($y = 1.32x + 0.02$);

2) male instars 11 - 13, female instars 11 + 12: ($y = 1.19x + 3.98$);

3) male instars 14 - 18: ($y = 1.07x + 15.75$); and

4) female instars 13, terminal molt: ($y = 0.96x + 17.59$)

Beginning with the first instar at a carapace width range 3.2 mm to 3.5 mm, equation 1 was used to calculate instar sizes up to and including the tenth instar for males and female, the site of an apparent inflection point (Figure 4); instars 11 - 13 for males and 11 and 12 for females were calculated from equation 2. Likewise male instars 14 - 18 and the female molt to maturity (last instar) were derived from equations 3 and 4, respectively.

No significant difference in growth (α = .05) was found between male and female juveniles up to a size of 69 mm CW. At this size males continue on the same growth schedule to instar 13 while females begin molting to maturity at a reduced growth rate. For males a change of slope at about 90 mm premolt CW (instar 13) which implies a change of growth rate is evident. The average 90 mm male grows to be 112 and 137 mm during two subsequent molts.

Size at Maturity

Maturity stages in females can be separated by the three events: (1) formation of the ovary, (2) production of orange ova, and (3) molt to maturity. At the molt to maturity females mate and ovulate for the first time. The ovary first appears in females of 40 mm - 50 mm CW though it is still absent in some crab in the 60 - 70 mm group. The size at which 50% of females exhibit orange ova is 68 mm CW (Figure 6), while 50% of the females at 83 mm have undergone the molt to maturity (Figure 7). There is an obvious increase in the growth rate of the abdominal flap of the female at the molt to maturity and a corresponding reduction in carapace growth (Figure 8).

Brown and Powell (1972) suggest the size at maturity for males, based on chela size and reproductive tract weight, is 110 mm and 113 mm CW, respectively.

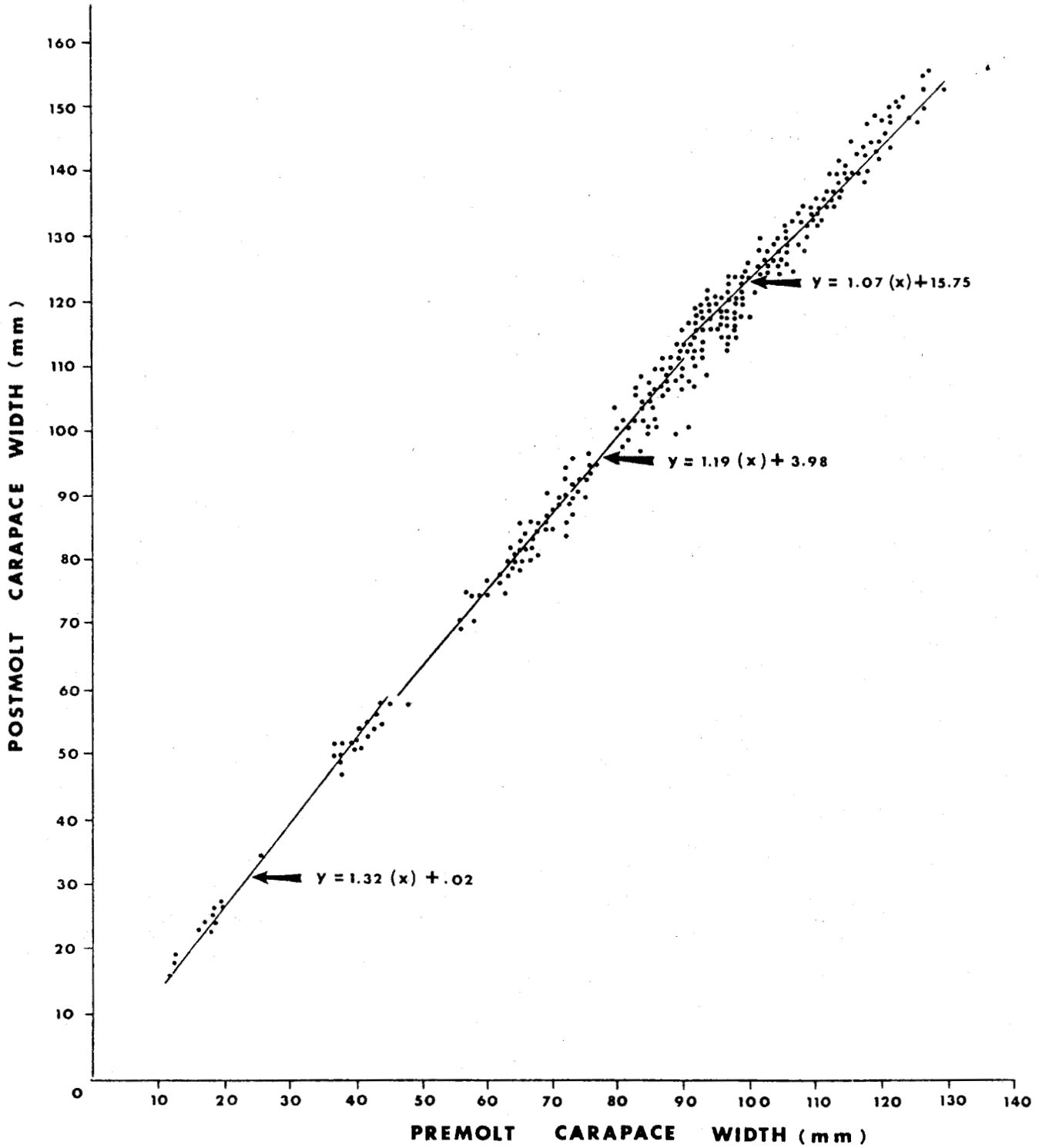

Figure 4. Premolt – postmolt carapace width relationship for male Chionoecetes bairdi held in ocean pens at Kodiak, Alaska.

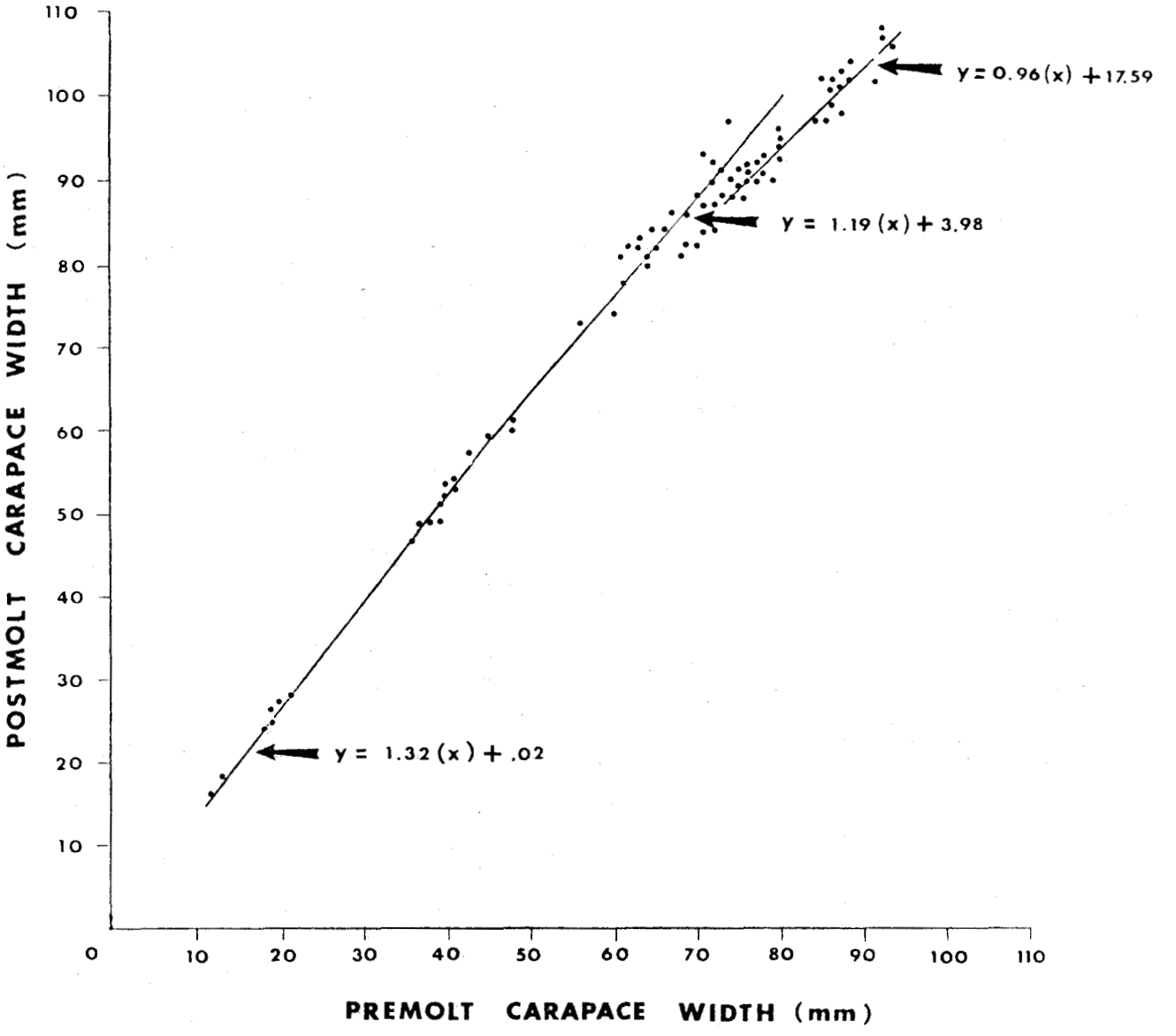

Figure 5. Premolt - postmolt carapace width relationship for female Chionoecetes bairdi held in ocean pens at Kodiak, Alaska.

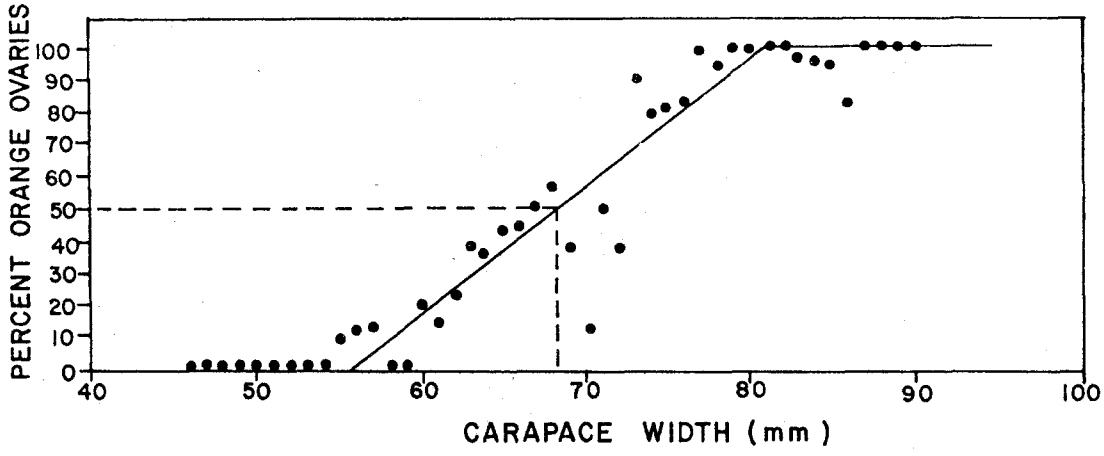

Figure 6. - Carapace width vs. percent of immature female *Chionoecetes bairdi* with orange eggs in ovaries.

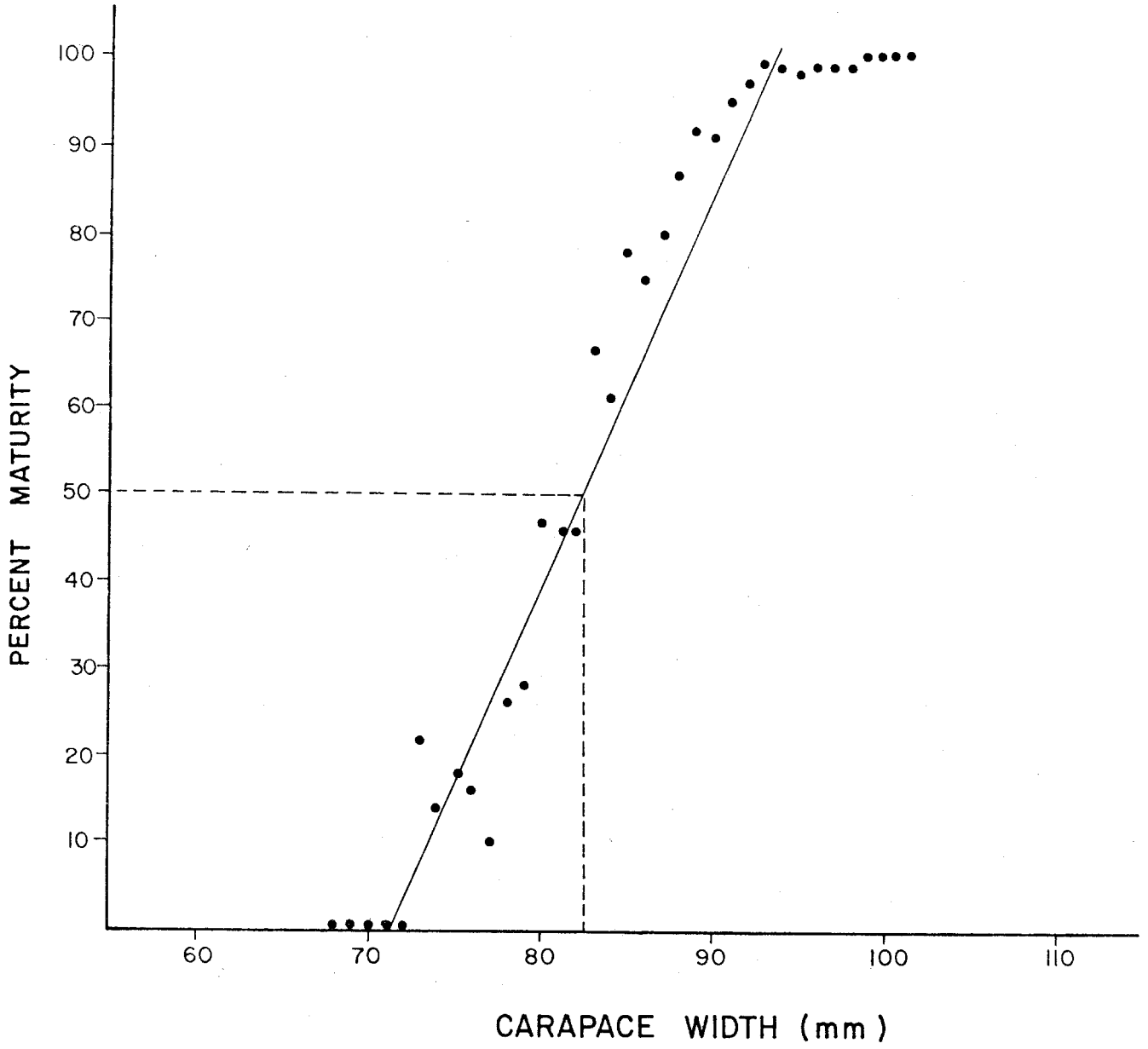

Figure 7.- Average size at maturity for female *Chionoecetes bairdi* at Kodiak, Alaska.

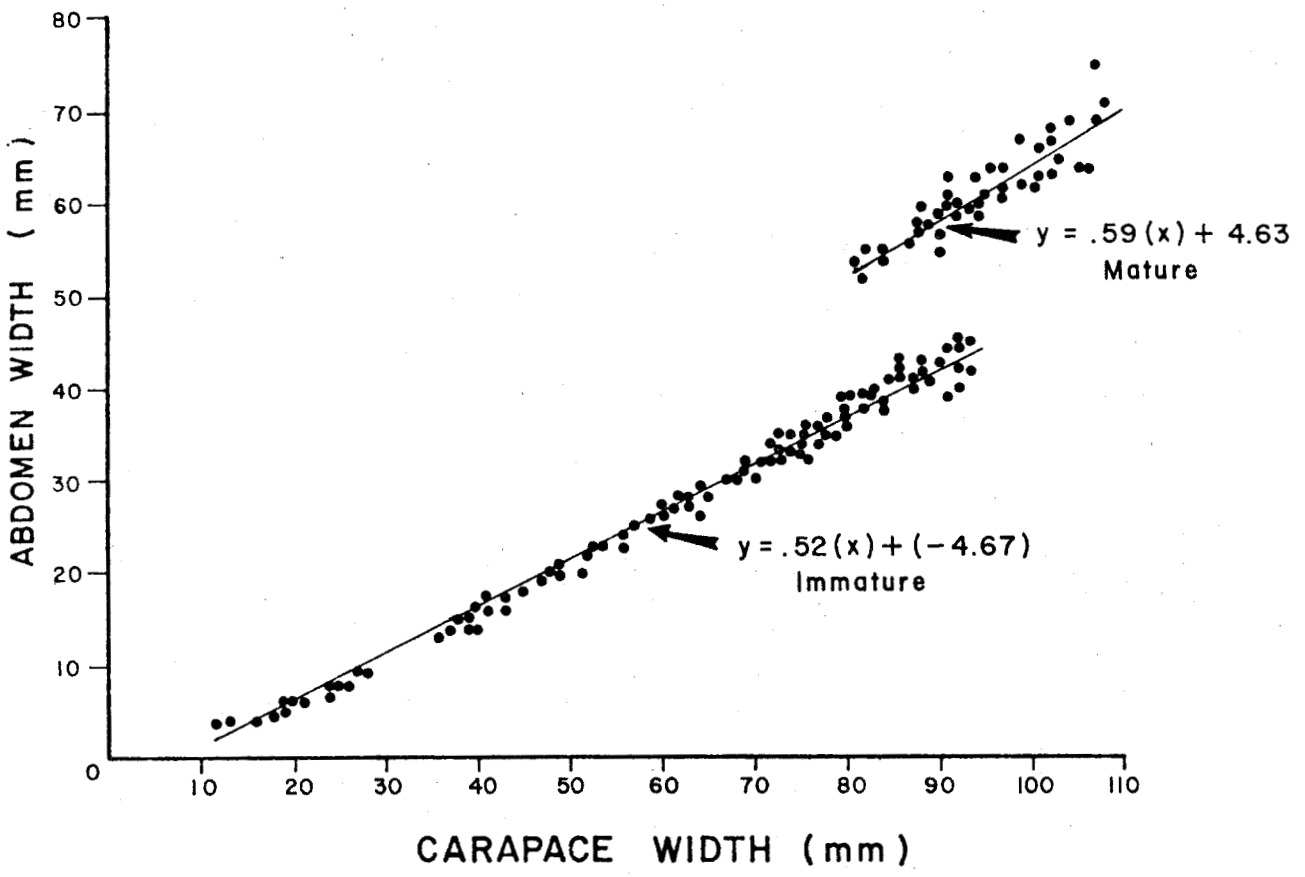

Figure 8 - Carapace Width - abdomen width relationship for female *Chionoecetes bairdi*

These sizes were selected by separating the data set into subsets based on a decrease in slope on the Hiatt diagrams. This method may have some problems, however. Somerton (1978) states that: "since the estimated slopes of the two lines are often similar, the premolt size of their intersection point may be quite different from x. When this occurs there is a problem using this type of model to predict postmolt size from premolt sizes lying in the interval bounded by x and the intersection point. If the intersection point is used to separate the regions over which each equation is used to predict postmolt size, then one of the two equations must be extrapolated beyond the range of data used to estimate it". Average size at maturity based on chela allometry of crabs from this study was determined to be 112 mm by Someton using the least sums of squares method which shows: "the intersection point producing the best fit of the straight line model occurs at a premolt size of 90 mm which corresponds to a postmolt carapace width of 112 mm".

Females in this study were found to produce fertile eggs at ovulation when mating with males as small as 90 mm. The average size of males mating with females molting to maturity was 113 mm.

Age and Growth Rate

Growth equations developed by Hiatt's method are used to predict the postmolt width of a given size crab. Using the three equations developed for males, a hypothetical crab can be followed through all its molts. To see how our predicted sizes match up with observed size frequency distributions as well as minimum and maximum sizes, three molting series were computed as described previously (Table 4) such that the crab passes through either 17.0, 18.0, or 19.0 mm. These sizes were chosen to match up with observed size frequency modes at 17 to 19 mm.

During July of 1974 and 1976, the first instar Tanner crab were found in the stomachs of Pacific cod (*Gadus macrocephalus*), tom cod (*Microgadus proximus*), and Pacific halibut (*Hippoglossus stenolepis*). In 1974 11 specimens averaged 3.4 mm CW with a range of 3.3 to 3.6 mm. Fourteen specimens collected in 1976 had an average width of 3.1 mm and a range of 2.9 to 3.4 mm.

Based on the observed mode from Prince William Sound in April 1972 (Table 1), it appears that crabs have reached 14 mm CW at 1 year of age. In the May-June period of the same year a mode of 18 mm apparently representing 14 month old crab was found. Crabs of 27 mm were found in January in Prince William Sound suggesting that they pass through their second winter at that size and achieve approximately 13 mm after three molts in their second year.

Samples collected in the Northern Gulf of Alaska adjacent to Prince William Sound in August 1973 contained size frequency modes at 40 and 54 mm. In 1976, samples from a near area in Prince William Sound were clustered around 85 and 105 mm. The animals apparently molted three times in the intervening 36 months making 85 and 105 mm crabs approximately 64 and 76 months of age, respectively. These data were used to calculate the intermolt period and project probable ages for crabs over 105 mm.

Table 4. Size-age relationships for *Chionoecetes bairdi*.

Instar No.	Carapace width (mm) ♂	♂	♂	♀	Predicted Age (months) $y = 0.69(x) - 0.52$
1	3.2	3.4	3.5	3.4	1.8
2	4.2	4.5	4.6	4.5	2.5
3	5.6	6.0	6.1	6.0	3.5
4	7.3	7.9	8.1	7.9	4.9
5	9.7	10.4	10.7	10.4	6.6
6	12.9	13.7	14.1	13.7	8.9
7	17.0	18.1	18.6	18.1	11.9
8	22.5	23.9	24.6	23.9	15.9
9	29.7	31.6	32.5	31.6	21.1
10	39.9	41.7	42.9	41.7	28.1
11	51.5	53.6	55.0	53.6	37.3
12	65.3	67.8	69.5	67.8	47.2
13	81.7	84.6	86.7	82.7	59.0
14	103.2	106.3	108.5		73.1
15	126.2	129.5	131.8		85.3
16	150.7	154.3	156.8		106.2
17	177.1	180.8	183.5		124.5
18	205.2	209.2	212.1		144.1

The regression of age in months (y) on carapace width (x) resulted in the equation $y = 0.69(x) - 0.52$. This equation was used to calculate age in months for the calculated instar sizes assuming no skip molting. The resultant molting scheme starting with a first instar size of 3.4 mm CW (Table 4) suggests that about 76 months or just over 6 years are required for the average male to achieve maturity, and further, that males reach the legal size of 140 mm CW at an age of 7.5 years. Rarely males larger than 200 mm are found in the commercial harvest. These animals would be 12 years old.

A time-series of prominent modes and intermolt periods, obtained by sampling a single population of small crab by scuba and trawls, substantiates our predicted instar sizes and intermolt periods from 9 mm - 54 mm (instars 5 - 11). Respective instar sizes and intermolt periods from the monitored population (Table 1) are almost identical to those predicted in Table 4. At present, the fishery is apparently removing animals between 7.5 and 12 years of age, or utilizing about 5 year classes. In Figure 9 carapace widths of male crabs are plotted against instar number and age in years formulating a model of growth.

Using the predicted age for average size male crabs in the population, and knowing the incremental growth increase with each molt, it is possible to determine the intermolt period as a function of size. Animals smaller than 35 mm molt more than twice per year. A 16 month intermolt period is indicated for males about 86 mm in width, and animals about 150 mm CW or about the average size in the commercial catch should shed their exoskeleton once every 18 months. Assuming skipmolting (molting every other year) after maturity, average size commercial crabs would be 10 to 12 years of age.

DISCUSSION

Molt Frequency

Animals spawned or hatched at discrete times of the year typically shows modes in their size frequency distributions. Tanner crab collected in Prince William Sound, Northern Gulf of Alaska, and waters around Kodiak in different years show very similar modal sizes. Because growth in size occurs only at ecdysis, the distance between size frequency modes should correspond to the increase in size at molting.

Growth Per Molt

Somerton (1978) concluded that, "the straight line model describes crustacean growth increment per molt data better than a hyperbolic model, especially when plots of the data display an abrupt change in slope". Based on the criterion of goodness of fit he demonstrated the appropriateness of the straight line mode for *C. bairdi* data. Therefore, we represent growth by the linear equation $y = a + bx$.

Inflection points along the straight line model indicates changes in growth

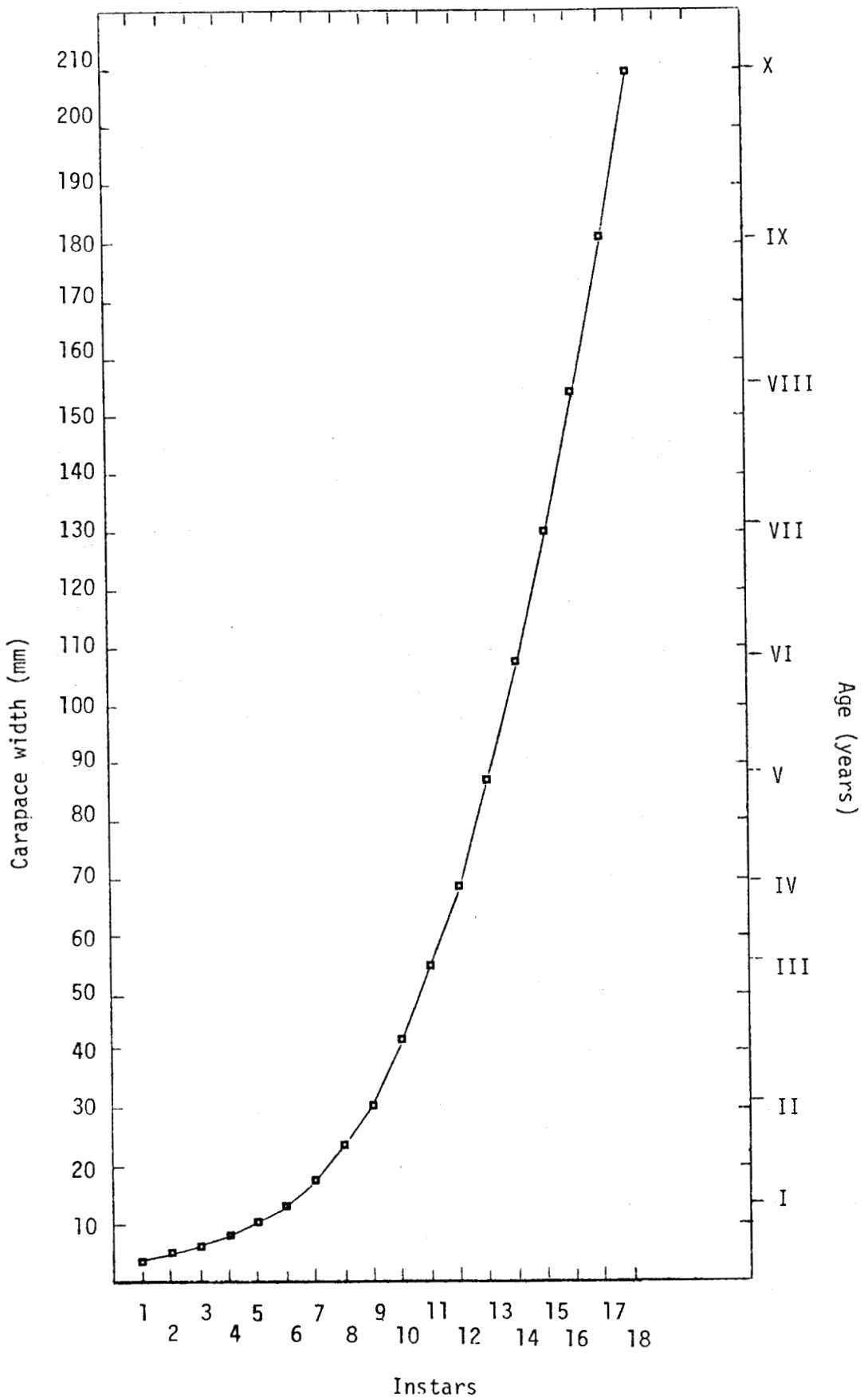

Figure 9 . Growth curve of male *Chionoecetes bairdi*

rate. Calculation of growth equations between inflection points resulted in better fit to the data than a single growth equation for the line. Both males and females show a significant change in growth rate at maturity. In females this change is quite dramatic. The change in growth rate at about 50 mm premolt width (Figure 4) may be associated with a change in lifestyle. An additional scuba survey in December 1979 covering the previous scuba collecting site revealed that the crab has dispersed from the area after more than 6 months. The population was subsequently found by trawling seaward from their previous nearshore habitation with prominent modes at 41 mm and 53 mm.

The results of other growth studies on C. *opilio* and an estimate of C. *bairdi* are in general agreement with our results. Miller and Watson (1976) showed that the percent growth per molt for immature C. *opilio* crabs decreases with increasing crab size. In addition, the average growth per molt reported for mature males and the female molt to maturity for C. *opilio* was 18.4 and 14.8%, respectively. The average growth per molt for C. *bairdi* mature male and the female molt to maturity was 20.9 and 17.9%, respectively (this study). Crude estimates of growth for C. *bairdi* in the Bering Sea by Hoopes, Karinen, and Pelto (1972) agree surprisingly well with our results. They estimated that a male C. *bairdi* of 150 mm width would be 7 - 8 years old, while our estimate for this size crab is 8.8 years.

We found no significant difference in growth per molt between juvenile males and females. These results are similar to those reported by Kon et al. (1968) and Ito (1970) for C. *opilio*. However, Miller and Watson (1976) report a significant difference in the percentage width increment per molt versus premolt width for immature crabs of both sexes.

Our estimates of growth ranged from 25 to 36% for the first to sixth molts preceding maturity. For the same six molts, growth of C. *opilio* ranged from 25 to 40% (Ito 1970; cited by Miller 1976) and from 31 to 43% (Kon et al. 1968; cited by Miller 1976).

Growth ranged from 14 to 22% over five post maturity molts (this study). Miller and Watson (1976) reported a constant 18% growth per molt for mature male C. *opilio*, however, they cite several studies on large decapods that commonly show decreasing percentage increments per molt for mature males.

Size at Maturity

Most researchers studying the family Majidae agree that females undergo their final molt as they reach maturity (Carlisle 1957; Knudsen 1964; Yoshida 1941; Hilsinger 1976). Based on the size of the largest juvenile females, growth per molt at maturity and the proportion of adult females with old shells, we have no reason to believe that even the largest adult females molt after reaching maturity.

After the ovary has formed in the female about 2 years pass before the orange ova begin to form. Average females would require an additional year to attain maturity.

The size at 50% maturity in females (83 mm CW) appears to be a good estimate

of the average size prior to the molt to maturity. An 83 mm female would grow to 97 mm at the molt to maturity.

Among males, 90 mm appears to be the size at which the molt to maturity occurs. Such an animal would grow to 112 mm. Since changes in body form occur at ecdysis estimates of size at maturity utilizing chela morphology would relate to the post molt size.

Age and Growth Rate

As with the growth per molt data, our age-size relationship matches fairly well with results for *C. opilio* (Miller and Watson 1976) and *C. bairdi* (Hoopes, Karinen, and Pelto 1970).

Extrapolating in a linear manner from the size-age relationship of small crab suggests a gradually increasing intermolt period rather than one which changes abruptly from say 6 months to 12 months to 24 months. Tag recoveries indicate that some mature individuals may not molt for 2 or 3 years. Forty-seven percent of the tagged crabs recovered (with tags that are lost at ecdysis) around Kodiak Island in 1975 were recovered between 1 and 2 years after release while 8% were recovered between 2 and 3 years after release. Three individuals tagged in July 1973 were recovered with tag intact 3.7 years later. Since approximately 50% of all crab tagged were skipmolts at the time of tagging, extensive intermolt periods are indicated for at least a portion of the mature male population (Donaldson 1980). It is still unknown when the terminal molt occurs in male Tanner crabs. Based on the size of crabs in the commercial harvest it appears that most crabs are harvested in their sixteenth instar and relatively few ever enter instar 17.

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APPENDICES

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

10 - 19

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
1	3-7-76	15.5	18.7	2.1	20.0	25.0	2.7	4.5	6.3	0.6
2	3-12-76	15.5	18.7	1.7	19.6	24.7	2.1	4.1	6.0	0.4
3	3-12-76	15.5	18.7	2.1	20.0	25.1	2.7	4.5	6.4	0.6
4	3-12-76	15.2	18.5	2.0	18.7	23.7	2.5	3.5	5.2	0.5
5	3-14-76	16.6	19.5	2.2	20.5	26.0	2.9	3.9	6.5	0.7
6	3-15-76	15.4	18.2	1.9	18.9	23.7	2.7	3.5	5.5	0.8
7	3-15-76	10.2	12.0	1.4	13.1	15.5	2.0	2.9	3.5	0.6
8	3-15-76	14.9	18.7	2.0	20.0	24.5	2.7	5.1	5.8	0.7
9	3-15-76	10.9	13.0	1.5	14.2	17.6	1.9	3.3	4.6	0.4
10	3-15-76	15.8	19.0	2.2	19.8	24.1	2.7	4.0	5.1	0.5
11	3-15-76	14.9	18.1	2.2	19.8	24.1	2.7	4.9	6.0	0.5
12	3-15-76	15.3	19.0	2.3	20.7	25.6	3.0	5.4	6.6	0.7
13	3-18-76	14.8	17.8	2.2	19.4	24.0	2.7	4.6	6.2	0.5
14	3-30-76	15.5	19.1	2.4	20.1	25.3	3.1	4.6	6.2	0.7
15	3-30-76	15.0	18.6	2.1	19.2	23.8	2.8	4.2	5.2	0.7
16	3-30-76	16.0	19.9	2.4	20.7	26.2	3.2	4.7	6.3	0.8
17	4-9-76	16.1	19.6	2.2	20.7	25.9	3.2	4.6	6.3	1.0
18	4-17-76	14.3	17.4	2.0	18.5	23.0	2.7	4.2	5.6	0.7
19	4-25-76	14.5	17.5	2.1	18.6	23.2	2.6	4.1	5.7	0.5
20	4-25-76	15.0	18.5	2.1	19.3	24.3	3.1	4.3	5.8	1.0
21	11-16-77	10.6	12.8	1.1	15.0	18.8	2.2	4.4	6.0	1.1

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

10 - 19 (continued)

No.	Date of Molt	Premolt (mm) length	Premolt (mm) width	Premolt (mm) right chela	Postmolt (mm) length	Postmolt (mm) width	Postmolt (mm) right chela	Growth (mm) length	Growth (mm) width	Growth (mm) right chela
	$\bar{X}$	14.6	17.7	2.0	18.8	23.5	2.67	4.25	5.75	0.66
	S.D.	1.78	2.25	0.33	2.13	2.80	0.37	0.60	0.73	0.19
	95% C.I. ±	3.48	4.41	0.64	4.17	5.48	0.72	1.17	1.43	0.37
					20 - 29					
1	3-3-76	20.7	26.4	3.1	26.5	34.7	4.1	5.8	8.3	1.0
2	3-7-76	16.2	20.0	2.1	20.8	26.5	3.1	4.6	6.5	1.0
	$\bar{X}$	18.4	23.2	2.6	23.6	30.6	3.6	5.2	7.4	1.0
	S.D.	3.18	4.52	0.70	4.03	5.79	0.70	0.84	1.27	0
	95% C.I. ±	6.23	8.85	1.37	7.89	11.34	1.37	1.64	2.48	-
					30 - 39					
1	3-4-76	30.0	38.2	4.8	38.5	52.0	6.0	8.5	13.8	1.2
2	4-9-76	31.2	39.9	4.7	39.0	50.7	6.0	7.8	10.8	1.3
3	3-20-77	29.7	37.7	4.8	36.7	47.0	5.5	7.0	9.3	0.7
4	11-15-77	29.4	37.7	5.0	38.3	50.0	6.1	8.9	12.3	1.1
5	11-15-77	29.9	37.2	5.0	38.8	49.9	6.6	8.9	12.7	1.6
6	11-16-77	30.6	38.8	5.0	40.0	51.6	6.7	9.4	12.8	1.7
7	11-25-77	28.5	36.7	4.4	38.2	49.2	6.0	9.7	12.5	1.6

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
	30 - 39 (continued)									
	$\bar{X}$	25.5	38.0	4.8	38.5	50.0	6.1	8.6	12.0	5.0
	S.D.	3.08	1.06	0.19	0.99	1.66	0.41	0.93	1.49	3.84
	95% C.I. ±	6.04	2.07	0.37	1.94	3.25	0.80	1.82	2.92	2.53
	40 - 49									
1	3-25-75	32.0	40.0	5.0	41.0	52.0	7.0	9.0	12.0	2.0
2	11-8-75	38.0	48.0	5.0	46.0	58.0	8.0	8.0	10.0	3.0
3	3-8-77	33.0	42.0	5.0	43.0	53.0	7.0	10.0	11.0	2.0
4	3-15-77	34.0	41.0	-	42.0	51.0	6.0	8.0	10.0	-
5	3-21-77	33.7	43.1	5.5	42.5	54.1	6.9	8.8	11.0	1.4
6	3-23-77	33.2	42.4	5.3	42.7	54.6	6.7	9.5	12.2	1.4
7	4-6-77	33.2	43.5	5.6	42.0	55.0	7.0	8.8	11.5	1.4
8	11-11-77	31.5	40.0	5.0	40.5	51.6	6.6	9.5	11.6	1.6
9	11-15-77	32.2	41.0	4.9	42.2	54.0	7.2	10.0	13.0	2.3
10	11-25-77	35.5	44.6	5.7	45.8	57.6	7.3	10.3	13.0	1.6
	$\bar{X}$	33.6	42.5	4.4	42.7	54.0	7.0	6.7	11.5	1.9
	S.D.	1.91	2.43	1.71	1.81	2.35	0.51	4.26	1.06	0.54
	95% C.I. ±	3.74	4.76	3.35	3.55	4.60	0.99	8.35	2.07	1.06

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

No.	Date of Molt	Premolt (mm)			Postmolt (mm)			Growth (mm)		
		length	width	right chela	length	width	right chela	length	width	right chela
50 - 59										
1	11-8-75	46.0	58.0	8.0	55.0	71.0	10.0	9.0	13.0	2.0
2	11-21-75	44.0	56.0	7.0	55.0	71.0	9.0	11.0	15.0	2.0
3	11-26-75	45.0	59.0	7.0	57.0	75.0	8.0	12.0	16.0	1.0
4	12-14-75	45.0	58.0	7.0	56.0	75.0	10.0	11.0	17.0	3.0
5	3-22-77	44.2	56.0	7.0	54.3	69.3	8.9	10.1	13.3	1.9
	$\bar{X}$	44.8	57.4	7.2	55.5	72.2	9.2	10.6	14.8	2.0
	S.D.	79.2	1.34	0.45	1.05	2.59	0.84	1.13	1.71	0.70
	95% C.I. ±	1.55	2.62	0.88	2.06	5.07	1.65	2.21	3.35	1.37
60 - 69										
1	5-19-74	49.0	63.0	8.0	62.0	80.0	10.0	13.0	17.0	2.0
2	5-20-74	54.0	68.0	10.0	66.0	86.0	13.0	12.0	18.0	3.0
3	6-1-74	51.0	68.0	9.0	66.0	87.0	12.0	15.0	19.0	3.0
4	6-1-74	52.0	68.0	9.0	69.0	85.0	13.0	17.0	17.0	4.0
5	6-1-74	50.0	64.0	8.0	62.0	80.0	10.0	12.0	16.0	2.0
6	1-13-75	52.0	67.0	9.0	60.0	80.0	11.0	8.0	13.0	2.0
7	5-3-75	50.0	63.0	9.0	60.0	75.0	10.0	10.0	12.0	1.0
8	11-10-75	51.0	65.0	8.0	62.0	80.0	10.0	11.0	15.0	2.0
9	11-10-75	48.0	62.0	8.0	61.0	78.0	11.0	13.0	16.0	3.0
10	11-10-75	53.0	69.0	10.0	65.0	85.0	13.0	12.0	16.0	3.0
11	11-12-75	50.0	64.0	9.0	62.0	81.0	11.0	12.0	17.0	2.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

60 - 69 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
12	11-12-75	49.0	63.0	8.0	59.0	78.0	11.0	10.0	15.0	3.0
13	11-16-75	52.0	63.0	9.0	61.0	78.0	11.0	9.0	15.0	2.0
14	11-16-75	53.0	67.0	9.0	63.0	82.0	11.0	10.0	15.0	2.0
15	11-16-75	52.0	67.0	9.0	65.0	83.0	11.0	13.0	16.0	2.0
16	11-19-75	52.0	65.0	8.0	64.0	83.0	11.0	12.0	18.0	3.0
17	11-19-75	49.0	64.0	9.0	61.0	80.0	11.0	12.0	16.0	2.0
18	11-19-75	49.0	64.0	9.0	62.0	81.0	11.0	13.0	17.0	2.0
19	11-21-75	53.0	69.0	10.0	67.0	87.0	12.0	14.0	18.0	2.0
20	11-21-75	51.0	65.0	9.0	62.0	79.0	10.0	11.0	14.0	1.0
21	11-24-75	50.0	65.0	9.0	62.0	80.0	11.0	12.0	15.0	2.0
22	11-24-75	49.0	64.0	8.0	62.0	80.0	11.0	13.0	16.0	3.0
23	11-24-75	50.0	64.0	10.0	61.0	80.0	11.0	11.0	16.0	1.0
24	11-30-75	48.0	60.0	8.0	59.0	75.0	10.0	11.0	15.0	2.0
25	11-30-75	52.0	68.0	9.0	62.0	81.0	10.0	10.0	13.0	1.0
26	12-3-75	50.0	64.0	8.0	62.0	82.0	12.0	12.0	18.0	4.0
27	12-3-75	53.0	67.0	9.0	63.0	86.0	12.0	10.0	19.0	3.0
28	12-3-75	50.0	66.0	9.0	63.0	84.0	11.0	13.0	18.0	2.0
29	12-5-75	54.0	69.0	9.0	67.0	86.0	11.0	13.0	17.0	2.0
30	12-10-75	50.0	65.0	8.0	62.0	82.0	11.0	12.0	17.0	3.0
31	12-11-75	51.0	66.0	9.0	63.0	82.0	11.0	12.0	16.0	2.0
32	12-11-75	50.0	63.0	9.0	63.0	80.0	11.0	13.0	17.0	2.0
33	12-14-75	49.0	64.0	9.0	60.0	79.0	11.0	11.0	15.0	2.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

60 - 69 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
34	12-14-75	55.0	69.0	9.0	69.0	91.0	14.0	14.0	22.0	5.0
35	12-14-75	46.0	60.0	7.0	57.0	77.0	10.0	11.0	17.0	3.0
36	12-14-75	54.0	69.0	-	64.0	85.0	-	10.0	16.0	-
37	12-14-75	52.0	68.0	9.0	66.0	87.0	12.0	14.0	19.0	3.0
38	1-5-76	53.0	69.0	9.0	66.0	87.0	13.0	13.0	18.0	4.0
39	3-8-77	51.0	64.0	9.0	62.0	80.0	11.0	11.0	16.0	2.0
40	3-23-77	48.0	62.0	8.0	60.0	77.0	10.0	12.0	15.0	2.0
	$\overline{X}$	50.9	65.3	8.8	62.8	81.7	11.2	11.9	16.3	2.4
	S.D.	1.99	2.53	0.67	2.68	3.63	0.99	1.68	1.86	0.90
	95% C.I. ±	3.90	4.95	1.31	5.25	7.11	1.94	3.29	3.64	1.76

70 - 79

1	2-8-74	55.0	70.0	-	69.0	88.0	-	14.0	18.0	-
2	3-10-74	60.0	77.0	11.0	74.0	95.0	14.0	14.0	18.0	3.0
3	5-19-74	55.0	71.0	10.0	68.0	89.0	13.0	13.0	18.0	3.0
4	6-1-74	60.0	76.0	10.0	73.0	95.0	14.0	13.0	19.0	4.0
5	6-1-74	55.0	70.0	10.0	65.0	85.0	11.0	10.0	15.0	1.0
6	6-8-74	56.0	74.0	11.0	70.0	91.0	13.0	14.0	17.0	2.0
7	12-13-74	55.0	72.0	9.0	72.0	93.0	14.0	17.0	21.0	5.0
8	1-13-75	57.0	75.0	9.0	71.0	93.0	13.0	14.0	18.0	4.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

70 - 79 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
9	11-8-75	59.0	76.0	10.0	72.0	94.0	14.0	13.0	18.0	4.0
10	11-10-75	57.0	73.0	10.0	69.0	90.0	12.0	12.0	17.0	2.0
11	11-12-75	60.0	74.0	11.0	71.0	91.0	12.0	11.0	17.0	1.0
12	11-14-75	61.0	76.0	11.0	77.0	95.0	14.0	16.0	19.0	3.0
13	11-16-75	56.0	71.0	10.0	70.0	90.0	13.0	14.0	19.0	3.0
14	11-16-75	56.0	74.0	10.0	72.0	93.0	14.0	16.0	19.0	4.0
15	11-16-75	57.0	76.0	14.0	70.0	95.0	15.0	13.0	19.0	1.0
16	11-16-75	55.0	72.0	10.0	64.0	84.0	12.0	9.0	12.0	2.0
17	11-24-75	57.0	75.0	11.0	69.0	90.0	13.0	12.0	15.0	2.0
18	12-10-75	59.0	76.0	10.0	74.0	94.0	14.0	15.0	18.0	4.0
19	12-14-75	55.0	73.0	9.0	69.0	92.0	14.0	14.0	19.0	5.0
20	12-14-75	54.0	71.0	10.0	69.0	90.0	13.0	15.0	19.0	3.0
21	1-13-76	56.0	73.0	10.0	69.0	91.0	12.0	13.0	18.0	2.0
22	1-13-76	61.0	76.0	11.0	76.0	97.0	14.0	15.0	21.0	3.0
23	1-28-76	57.0	72.0	10.0	67.0	86.0	10.0	10.0	14.0	5.0
24	3-8-77	56.0	73.0	9.0	68.0	89.0	12.0	12.0	16.0	3.0
25	11-25-77	57.0	72.0	10.0	75.0	95.0	14.0	18.0	23.0	4.0
	$\bar{X}$	57.0	73.5	10.3	70.5	91.4	13.3	13.5	17.8	3.0
	S.D.	2.09	2.12	1.03	3.18	3.37	1.04	2.16	2.29	1.23
	95% C.I. ±	4.10	4.15	2.02	6.23	6.60	2.04	4.23	4.48	2.41

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

80 - 89

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
1	2-13-74	66.0	86.0	12.0	77.0	101.0	18.0	11.0	15.0	6.0
2	5-4-74	67.0	88.0	13.0	85.0	112.0	18.0	18.0	24.0	5.0
3	5-19-74	68.0	87.0	12.0	85.0	110.0	16.0	17.0	23.0	4.0
4	5-26-74	68.0	88.0	13.0	84.0	107.0	17.0	16.0	19.0	4.0
5	6-4-74	65.0	84.0	13.0	78.0	102.0	15.0	13.0	18.0	2.0
6	6-9-74	63.0	80.0	12.0	78.0	101.0	15.0	15.0	21.0	3.0
7	12-16-74	64.0	81.0	12.0	80.0	102.0	16.0	16.0	21.0	4.0
8	12-17-74	70.0	89.0	13.0	88.0	114.0	18.0	18.0	25.0	5.0
9	12-17-74	67.0	87.0	12.0	86.0	112.0	18.0	19.0	25.0	6.0
10	12-18-74	65.0	85.0	12.0	79.0	101.0	15.0	14.0	16.0	3.0
11	12-21-74	67.0	84.0	12.0	83.0	105.0	15.0	16.0	21.0	3.0
12	1-4-75	67.0	86.0	12.0	84.0	110.0	18.0	17.0	24.0	6.0
13	1-6-75	68.0	88.0	12.0	85.0	110.0	16.0	17.0	22.0	4.0
14	1-9-75	66.0	87.0	11.0	86.0	112.0	21.0	20.0	25.0	10.0
15	1-15-75	68.0	89.0	12.0	87.0	112.0	19.0	19.0	23.0	7.0
16	1-15-75	68.0	88.0	13.0	82.0	107.0	15.0	14.0	19.0	2.0
17	1-19-75	67.0	85.0	12.0	83.0	106.0	16.0	16.0	21.0	4.0
18	1-24-75	68.0	87.0	13.0	82.0	106.0	18.0	14.0	19.0	5.0
19	1-25-75	69.0	88.0	12.0	84.0	109.0	21.0	15.0	21.0	9.0
20	1-28-75	65.0	85.0	12.0	83.0	108.0	16.0	18.0	23.0	4.0
21	2-19-75	64.0	82.0	12.0	79.0	101.0	15.0	15.0	19.0	3.0
22	5-3-75	67.0	85.0	13.0	78.0	100.0	18.0	11.0	15.0	5.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

80 - 89 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
23	11-14-75	66.0	87.0	12.0	81.0	107.0	17.0	15.0	20.0	5.0
24	11-14-75	65.0	81.0	11.0	76.0	96.0	20.0	11.0	15.0	9.0
25	11-14-75	65.0	85.0	13.0	78.0	101.0	19.0	13.0	16.0	6.0
26	11-21-75	69.0	89.0	8.0	78.0	100.0	18.0	9.0	11.0	10.0
27	11-21-75	64.0	84.0	12.0	77.0	102.0	15.0	13.0	18.0	3.0
28	11-24-75	63.0	81.0	11.0	75.0	98.0	15.0	12.0	17.0	4.0
29	12-3-75	64.0	85.0	12.0	80.0	104.0	17.0	16.0	19.0	5.0
30	12-3-75	64.0	82.0	12.0	75.0	99.0	18.0	11.0	17.0	6.0
31	12-5-75	67.0	87.0	12.0	82.0	107.0	14.0	15.0	20.0	2.0
32	12-14-75	56.0	88.0	13.0	71.0	108.0	16.0	15.0	20.0	3.0
33	12-18-75	62.0	84.0	12.0	79.0	104.0	15.0	17.0	20.0	3.0
34	1-10-76	65.0	83.0	11.0	78.0	102.0	15.0	13.0	19.0	4.0
35	1-13-76	69.0	89.0	13.0	82.0	108.0	16.0	13.0	19.0	3.0
36	1-13-76	65.0	85.0	12.0	80.0	104.0	16.0	15.0	20.0	4.0
37	1-13-76	63.0	83.0	12.0	79.0	102.0	16.0	16.0	19.0	4.0
38	1-25-76	68.0	87.0	13.0	85.0	110.0	17.0	17.0	23.0	4.0
39	1-26-76	65.0	84.0	12.0	81.0	104.0	16.0	16.0	20.0	4.0
40	1-28-76	64.0	83.0	12.0	80.0	102.0	16.0	16.0	19.0	4.0
41	2-2-76	64.0	86.0	12.0	78.0	102.0	14.0	14.0	16.0	2.0
42	2-2-76	63.0	83.0	11.0	80.0	107.0	16.0	17.0	24.0	5.0
43	2-2-76	64.0	81.0	7.0	79.0	102.0	15.0	15.0	21.0	8.0
44	2-19-76	67.0	86.0	12.0	82.0	107.0	16.0	15.0	21.0	4.0

APPENDIX TABLE 1.-- Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

80 - 89 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
45	2-19-76	64.0	83.0	12.0	80.0	106.0	16.0	16.0	23.0	4.0
46	12-7-76	61.0	80.0	10.0	80.0	104.0	14.0	19.0	24.0	4.0
47	12-7-76	70.0	88.0	13.0	88.0	110.0	17.0	18.0	22.0	4.0
	$\bar{X}$	65.6	85.2	10.3	80.9	105.2	16.1	15.2	20.0	4.6
	S.D.	2.59	2.62	3.70	3.64	4.28	2.67	2.40	3.08	1.97
	95% C.I. ±	5.08	5.14	7.25	7.13	8.39	5.23	4.70	6.04	3.86

90 - 99

1	1-31-74	71.0	93.0	-	88.0	116.0	-	17.0	23.0	-
2	5-13-74	73.0	94.0	12.0	91.0	116.0	19.0	18.0	22.0	7.0
3	5-11-74	75.0	96.0	14.0	91.0	115.0	18.0	16.0	19.0	4.0
4	5-19-74	74.0	94.0	15.0	86.0	109.0	19.0	12.0	15.0	4.0
5	5-20-74	74.0	98.0	15.0	90.0	119.0	25.0	16.0	21.0	10.0
6	5-20-74	69.0	90.0	11.0	87.0	114.0	18.0	18.0	24.0	7.0
7	5-20-74	72.0	92.0	14.0	88.0	115.0	19.0	16.0	23.0	5.0
8	5-20-74	73.0	97.0	14.0	90.0	119.0	17.0	17.0	22.0	3.0
9	6-2-74	72.0	94.0	14.0	89.0	116.0	17.0	17.0	22.0	3.0
10	6-9-74	73.0	93.0	14.0	89.0	113.0	18.0	16.0	20.0	4.0
11	12-16-74	73.0	94.0	13.0	94.0	121.0	20.0	21.0	27.0	7.0
12	12-16-74	76.0	98.0	15.0	92.0	117.0	25.0	16.0	19.0	10.0
13	12-16-74	74.0	97.0	14.0	85.0	113.0	21.0	11.0	16.0	7.0
14	12-17-74	72.0	93.0	13.0	89.0	114.0	23.0	17.0	21.0	10.0
15	12-19-74	72.0	93.0	13.0	92.0	119.0	18.0	20.0	26.0	5.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

90 - 99 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
16	12-20-74	72.0	92.0	13.0	91.0	117.0	22.0	19.0	25.0	9.0
17	12-21-74	74.0	93.0	13.0	89.0	116.0	19.0	15.0	23.0	6.0
18	12-24-74	70.0	92.0	13.0	89.0	118.0	18.0	19.0	26.0	5.0
19	12-24-74	70.0	92.0	12.0	90.0	116.0	18.0	20.0	24.0	6.0
20	12-27-74	76.0	97.0	14.0	97.0	123.0	19.0	21.0	26.0	5.0
21	12-28-74	72.0	96.0	14.0	89.0	117.0	23.0	17.0	21.0	9.0
22	12-28-74	75.0	97.0	15.0	91.0	117.0	26.0	16.0	20.0	11.0
23	1-4-75	73.0	96.0	14.0	90.0	119.0	24.0	17.0	23.0	10.0
24	1-6-75	71.0	92.0	13.0	90.0	117.0	17.0	19.0	25.0	4.0
25	1-7-75	73.0	98.0	14.0	93.0	124.0	19.0	20.0	26.0	5.0
26	1-8-75	74.0	93.0	13.0	88.0	112.0	17.0	14.0	19.0	4.0
27	1-13-75	77.0	97.0	15.0	94.0	124.0	19.0	17.0	27.0	4.0
28	1-13-75	75.0	96.0	14.0	90.0	118.0	23.0	15.0	22.0	9.0
29	1-15-75	69.0	93.0	13.0	89.0	118.0	18.0	20.0	25.0	5.0
30	1-17-75	77.0	99.0	15.0	92.0	123.0	28.0	15.0	24.0	13.0
31	1-19-75	75.0	97.0	14.0	95.0	123.0	19.0	20.0	26.0	5.0
32	1-19-75	72.0	92.0	13.0	88.0	113.0	22.0	16.0	21.0	9.0
33	1-19-75	78.0	97.0	15.0	96.0	122.0	25.0	18.0	25.0	10.0
34	1-21-75	75.0	96.0	14.0	92.0	119.0	26.0	17.0	23.0	12.0
35	1-21-75	74.0	97.0	14.0	88.0	114.0	18.0	14.0	17.0	4.0
36	1-24-75	74.0	92.0	14.0	95.0	119.0	20.0	21.0	27.0	6.0
37	1-24-75	74.0	95.0	13.0	92.0	120.0	18.0	18.0	25.0	5.0
38	1-25-75	72.0	95.0	14.0	91.0	121.0	19.0	19.0	26.0	5.0
39	2-2-75	72.0	96.0	14.0	91.0	121.0	19.0	19.0	25.0	5.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

90 - 99 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
40	2-3-75	70.0	94.0	14.0	89.0	119.0	20.0	19.0	25.0	6.0
41	3-4-75	76.0	99.0	15.0	95.0	124.0	21.0	19.0	25.0	6.0
42	3-22-75	72.0	94.0	13.0	93.0	122.0	19.0	21.0	28.0	6.0
43	11-16-75	72.0	92.0	13.0	83.0	107.0	20.0	11.0	15.0	7.0
44	11-19-75	71.0	93.0	13.0	85.0	113.0	22.0	14.0	20.0	9.0
45	11-21-75	71.0	92.0	14.0	85.0	110.0	24.0	14.0	18.0	10.0
46	11-30-75	73.0	93.0	19.0	91.0	116.0	-	18.0	23.0	-
47	11-30-75	69.0	90.0	12.0	85.0	110.0	17.0	16.0	20.0	5.0
48	12-5-75	72.0	91.0	13.0	90.0	113.0	18.0	18.0	22.0	5.0
49	12-8-75	72.0	92.0	13.0	86.0	110.0	22.0	14.0	18.0	9.0
50	12-14-75	71.0	91.0	-	91.0	117.0	-	20.0	26.0	-
51	12-14-75	69.0	90.0	12.0	85.0	113.0	18.0	16.0	23.0	6.0
52	1-5-76	69.0	90.0	13.0	85.0	113.0	18.0	16.0	23.0	5.0
53	1-13-76	69.0	90.0	14.0	83.0	109.0	23.0	14.0	19.0	9.0
54	1-13-76	72.0	92.0	14.0	91.0	118.0	20.0	19.0	26.0	6.0
55	1-13-76	70.0	91.0	13.0	87.0	114.0	17.0	17.0	23.0	4.0
56	1-26-76	76.0	98.0	14.0	90.0	118.0	22.0	14.0	20.0	8.0
57	1-28-76	71.0	92.0	14.0	90.0	117.0	18.0	19.0	25.0	4.0
58	1-28-76	71.0	90.0	11.0	83.0	107.0	17.0	12.0	17.0	6.0
59	2-2-76	74.0	97.0	14.0	95.0	122.0	20.0	21.0	25.0	6.0
60	2-2-76	77.0	99.0	16.0	95.0	122.0	26.0	18.0	23.0	10.0
61	2-2-76	74.0	93.0	12.0	93.0	120.0	17.0	19.0	27.0	5.0
62	2-2-76	73.0	93.0	14.0	95.0	118.0	19.0	22.0	25.0	5.0
63	2-2-76	76.0	98.0	19.0	88.0	116.0	21.0	12.0	18.0	3.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

90 - 99 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
64	2-2-76	74.0	95.0	14.0	92.0	120.0	19.0	18.0	25.0	5.0
65	2-2-76	73.0	95.0	14.0	90.0	116.0	19.0	17.0	21.0	5.0
66	2-4-76	75.0	99.0	15.0	90.0	118.0	22.0	15.0	19.0	8.0
67	2-4-76	71.0	90.0	13.0	90.0	116.0	18.0	19.0	26.0	7.0
68	2-4-76	74.0	97.0	15.0	90.0	118.0	23.0	16.0	21.0	8.0
69	2-3-76	72.0	92.0	14.0	92.0	118.0	20.0	20.0	26.0	6.0
70	2-3-76	70.0	90.0	14.0	85.0	110.0	22.0	15.0	20.0	8.0
71	2-3-76	78.0	97.0	15.0	92.0	115.0	24.0	14.0	18.0	9.0
72	2-5-76	71.0	92.0	14.0	87.0	112.0	18.0	16.0	20.0	4.0
73	2-5-76	71.0	91.0	14.0	79.0	101.0	17.0	8.0	10.0	3.0
74	2-5-76	73.0	94.0	14.0	90.0	118.0	18.0	17.0	24.0	4.0
75	2-6-76	76.0	99.0	15.0	90.0	120.0	23.0	14.0	21.0	8.0
76	2-7-76	75.0	96.0	14.0	92.0	118.0	23.0	17.0	22.0	9.0
77	2-7-76	77.0	98.0	15.0	94.0	120.0	20.0	17.0	22.0	5.0
78	2-7-76	69.0	90.0	12.0	88.0	113.0	17.0	19.0	23.0	5.0
79	2-17-76	78.0	98.0	15.0	92.0	115.0	23.0	14.0	17.0	8.0
80	2-17-76	75.0	97.0	15.0	93.0	121.0	20.0	18.0	24.0	5.0
81	2-17-76	70.0	92.0	13.0	85.0	112.0	17.0	15.0	20.0	4.0
82	2-19-76	70.0	90.0	14.0	84.0	110.0	21.0	14.0	20.0	7.0
83	2-19-76	71.0	91.0	13.0	82.0	108.0	20.0	11.0	17.0	7.0
84	2-19-76	72.0	94.0	14.0	91.0	119.0	19.0	19.0	25.0	5.0
85	2-19-76	71.0	93.0	14.0	90.0	118.0	18.0	19.0	25.0	4.0
86	2-19-76	74.0	98.0	15.0	94.0	124.0	20.0	20.0	26.0	5.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

90 - 99 (continued)

No.	Date of Molt	Premolt (mm) length	Premolt (mm) width	Premolt (mm) right chela	Postmolt (mm) length	Postmolt (mm) width	Postmolt (mm) right chela	Growth (mm) length	Growth (mm) width	Growth (mm) right chela
87	2-22-76	76.0	98.0	15.0	92.0	121.0	26.0	16.0	23.0	11.0
88	2-22-76	75.0	97.0	14.0	91.0	119.0	19.0	16.0	22.0	5.0
89	2-22-76	75.0	99.0	15.0	93.0	121.0	25.0	18.0	22.0	10.0
90	2-22-76	77.0	99.0	15.0	94.0	124.0	19.0	17.0	25.0	4.0
91	2-25-76	76.0	99.0	15.0	94.0	123.0	25.0	18.0	24.0	10.0
92	2-25-76	73.0	94.0	14.0	92.0	120.0	19.0	19.0	26.0	5.0
93	11-3-77	75.0	97.0	15.0	90.0	115.0	23.0	15.0	18.0	8.0
	$\bar{X}$	73.1	94.4	13.7	89.9	116.7	20.3	16.9	22.0	6.7
	S.D.	2.38	2.87	1.91	3.45	4.49	2.74	2.69	4.07	3.77
	95% C.I. ±	4.66	5.62	3.74	6.76	8.80	5.37	5.27	7.97	7.39

100 - 109

1	2-13-74	78.0	101.0	15.0	94.0	122.0	25.0	16.0	21.0	10.0
2	4-30-74	79.0	100.0	15.0	93.0	118.0	22.0	14.0	18.0	7.0
3	12-11-74	81.0	103.0	16.0	100.0	128.0	24.0	19.0	25.0	8.0
4	12-16-74	85.0	109.0	17.0	100.0	128.0	26.0	15.0	19.0	9.0
5	12-16-74	78.0	102.0	16.0	96.0	125.0	25.0	18.0	23.0	9.0
6	12-22-74	83.0	108.0	17.0	102.0	134.0	28.0	19.0	26.0	11.0
7	12-24-74	79.0	103.0	15.0	94.0	123.0	26.0	15.0	20.0	11.0
8	12-30-74	80.0	104.0	-	96.0	127.0	28.0	16.0	23.0	-
9	1-1-75	82.0	103.0	16.0	99.0	127.0	27.0	17.0	24.0	11.0
10	1-1-75	80.0	106.0	16.0	98.0	129.0	28.0	18.0	23.0	12.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

100 - 109 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
35	2-20-75	86.0	107.0	-	101.0	133.0	28.0	15.0	26.0	-
36	2-20-75	81.0	106.0	-	99.0	129.0	30.0	18.0	23.0	-
37	2-20-75	82.0	106.0	-	102.0	130.0	30.0	20.0	24.0	-
38	12-10-75	81.0	103.0	16.0	95.0	123.0	25.0	14.0	20.0	9.0
39	12-14-75	79.0	102.0	16.0	96.0	123.0	27.0	17.0	21.0	11.0
40	1-25-76	79.0	100.0	15.0	99.0	127.0	28.0	20.0	27.0	13.0
41	2-2-76	80.0	102.0	17.0	95.0	123.0	27.0	15.0	21.0	10.0
42	2-5-76	82.0	107.0	16.0	95.0	125.0	24.0	13.0	18.0	8.0
43	2-6-76	83.0	109.0	16.0	97.0	130.0	24.0	14.0	21.0	8.0
44	2-19-76	83.0	106.0	17.0	101.0	131.0	28.0	18.0	25.0	11.0
45	2-23-76	82.0	102.0	17.0	102.0	130.0	29.0	20.0	28.0	12.0
46	2-22-76	84.0	109.0	17.0	105.0	135.0	31.0	21.0	26.0	14.0
47	2-22-76	79.0	103.0	15.0	95.0	126.0	27.0	16.0	23.0	12.0
48	12-7-76	80.0	102.0	16.0	95.0	121.0	24.0	15.0	19.0	8.0
49	11-3-77	84.0	109.0	17.0	100.0	128.0	26.0	16.0	19.0	9.0
50	11-11-77	80.0	105.0	16.0	97.0	126.0	26.0	17.0	21.0	10.0
	$\bar{X}$	81.2	104.6	16.0	98.4	127.6	26.7	17.3	22.9	10.2
	S.D.	2.36	2.86	1.74	3.35	3.58	2.65	2.39	2.45	2.26
	95% C.I. ±	4.63	5.60	3.41	6.56	7.01	5.19	4.68	4.80	4.43

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

100 - 109 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
11	1-3-75	80.0	104.0	16.0	97.0	129.0	28.0	17.0	25.0	12.0
12	1-4-75	82.0	103.0	15.0	98.0	126.0	25.0	16.0	23.0	10.0
13	1-6-75	80.0	105.0	17.0	98.0	128.0	30.0	18.0	23.0	13.0
14	1-7-75	85.0	109.0	17.0	102.0	132.0	27.0	17.0	23.0	10.0
15	1-7-75	77.0	102.0	15.0	95.0	128.0	21.0	18.0	26.0	6.0
16	1-10-75	77.0	100.0	15.0	94.0	124.0	27.0	17.0	24.0	12.0
17	1-10-75	81.0	105.0	16.0	95.0	127.0	26.0	14.0	22.0	10.0
18	1-11-75	82.0	105.0	16.0	100.0	130.0	28.0	18.0	25.0	12.0
19	1-11-75	80.0	106.0	15.0	98.0	126.0	25.0	18.0	20.0	10.0
20	1-13-75	83.0	106.0	17.0	100.0	128.0	23.0	17.0	22.0	6.0
21	1-13-75	84.0	108.0	17.0	102.0	129.0	30.0	18.0	21.0	13.0
22	1-15-75	80.0	103.0	16.0	95.0	125.0	26.0	15.0	22.0	10.0
23	1-15-75	78.0	102.0	16.0	97.0	127.0	28.0	19.0	25.0	12.0
24	1-19-75	81.0	105.0	15.0	98.0	125.0	27.0	17.0	20.0	12.0
25	1-19-75	79.0	100.0	15.0	97.0	125.0	20.0	18.0	25.0	5.0
26	1-21-75	81.0	105.0	16.0	109.0	130.0	26.0	28.0	25.0	10.0
27	1-21-75	81.0	106.0	17.0	97.0	128.0	28.0	16.0	22.0	11.0
28	1-25-75	84.0	108.0	17.0	101.0	133.0	30.0	17.0	25.0	13.0
29	1-29-75	85.0	109.0	17.0	105.0	132.0	31.0	20.0	23.0	14.0
30	2-7-75	81.0	102.0	18.0	99.0	125.0	31.0	18.0	23.0	13.0
31	2-11-75	76.0	100.0	15.0	95.0	126.0	20.0	19.0	26.0	5.0
32	2-11-75	84.0	109.0	17.0	102.0	132.0	26.0	18.0	23.0	9.0
33	2-26-75	85.0	108.0	18.0	102.0	133.0	28.0	17.0	25.0	10.0
34	2-20-75	82.0	106.0	-	100.0	132.0	29.0	18.0	26.0	-

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapabe width intervals by date of molt.

110 - 119

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
1	3-16-74	83.0	115.0	16.0	102.0	139.0	28.0	19.0	24.0	12.0
2	12-24-74	91.0	113.0	17.0	107.0	136.0	30.0	16.0	23.0	13.0
3	1-15-75	91.0	119.0	19.0	110.0	145.0	27.0	19.0	26.0	8.0
4	1-15-75	92.0	118.0	19.0	112.0	140.0	-	20.0	22.0	-
5	1-22-75	86.0	112.0	17.0	104.0	137.0	29.0	18.0	25.0	12.0
6	1-24-75	89.0	117.0	19.0	106.0	140.0	31.0	17.0	23.0	12.0
7	1-28-75	90.0	115.0	18.0	108.0	139.0	31.0	18.0	24.0	13.0
8	1-28-75	87.0	112.0	17.0	104.0	132.0	26.0	17.0	20.0	9.0
9	1-28-75	89.0	114.0	17.0	106.0	136.0	27.0	17.0	22.0	10.0
10	1-31-75	90.0	117.0	19.0	109.0	143.0	35.0	19.0	26.0	16.0
11	2-1-75	85.0	111.0	17.0	101.0	133.0	27.0	16.0	22.0	10.0
12	2-3-75	89.0	114.0	18.0	109.0	137.0	30.0	20.0	23.0	12.0
13	2-4-75	85.0	111.0	17.0	102.0	136.0	28.0	17.0	25.0	11.0
14	2-5-75	87.0	113.0	18.0	104.0	137.0	29.0	17.0	24.0	11.0
15	2-5-75	86.0	112.0	17.0	104.0	136.0	32.0	18.0	24.0	15.0
16	2-6-75	89.0	114.0	18.0	107.0	140.0	30.0	18.0	26.0	12.0
17	2-6-75	92.0	117.0	19.0	114.0	143.0	34.0	22.0	26.0	15.0
18	2-6-75	91.0	115.0	17.0	107.0	141.0	31.0	16.0	26.0	14.0
19	2-6-75	88.0	111.0	18.0	108.0	136.0	32.0	20.0	25.0	14.0
20	2-6-75	88.0	111.0	18.0	108.0	136.0	32.0	20.0	25.0	14.0
21	2-7-75	83.0	110.0	17.0	102.0	133.0	30.0	19.0	23.0	13.0
22	2-9-75	85.0	112.0	18.0	103.0	135.0	29.0	18.0	23.0	11.0
23	2-9-75	86.0	110.0	18.0	102.0	133.0	30.0	16.0	23.0	12.0
24	2-9-75	85.0	115.0	18.0	106.0	139.0	31.0	21.0	24.0	13.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

110 - 119 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
25	2-9-75	89.0	116.0	18.0	106.0	140.0	28.0	17.0	24.0	10.0
26	2-9-75	88.0	114.0	18.0	108.0	142.0	31.0	20.0	28.0	13.0
27	2-10-75	90.0	114.0	18.0	108.0	138.0	28.0	18.0	24.0	10.0
28	2-10-75	89.0	115.0	19.0	107.0	140.0	31.0	18.0	25.0	12.0
29	2-10-75	91.0	118.0	20.0	114.0	144.0	34.0	23.0	26.0	14.0
30	2-10-75	90.0	118.0	19.0	112.0	143.0	33.0	22.0	25.0	14.0
31	2-10-75	88.0	115.0	19.0	112.0	145.0	34.0	24.0	30.0	15.0
32	2-10-75	87.0	113.0	19.0	106.0	135.0	33.0	19.0	22.0	14.0
33	2-10-75	88.0	114.0	18.0	105.0	138.9	31.0	17.0	24.0	13.0
34	2-11-75	85.0	111.0	17.0	101.0	132.0	28.0	16.0	21.0	11.0
35	2-11-75	87.0	110.0	18.0	103.0	134.0	29.0	16.0	24.0	11.0
36	2-11-75	88.0	115.0	17.0	110.0	145.0	31.0	22.0	30.0	14.0
37	2-14-75	86.0	113.0	18.0	105.0	137.0	33.0	19.0	24.0	15.0
38	2-15-75	88.0	111.0	17.0	109.0	135.0	30.0	21.0	24.0	13.0
39	2-26-75	84.0	111.0	17.0	101.0	134.0	29.0	17.0	23.0	12.0
40	3-6-75	93.0	118.0	19.0	108.0	138.0	32.0	15.0	20.0	13.0
41	3-9-75	89.0	113.0	17.0	108.0	135.0	32.0	19.0	22.0	15.0
42	2-22-76	85.0	113.0	19.0	108.0	140.0	32.0	23.0	27.0	13.0
43	2-22-76	88.0	117.0	20.0	105.0	140.0	31.0	17.0	23.0	11.0
44	2-22-76	88.0	118.0	19.0	103.0	138.0	29.0	15.0	20.0	10.0
45	2-25-76	90.0	118.0	19.0	108.0	143.0	30.0	18.0	25.0	11.0
46	2-25-76	93.0	118.0	20.0	115.0	148.0	33.0	22.0	30.0	13.0
47	3-3-76	85.0	110.0	18.0	105.0	135.0	30.0	20.0	25.0	12.0
48	3-3-76	85.0	111.0	18.0	101.0	133.0	28.0	16.0	22.0	10.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

110 - 119 (continued)

No.	Date of Molt	Premolt (mm) length	Premolt (mm) width	Premolt (mm) right chela	Postmolt (mm) length	Postmolt (mm) width	Postmolt (mm) right chela	Growth (mm) length	Growth (mm) width	Growth (mm) right chela
	$\bar{X}$	87.9	114.0	18.1	106.5	138.2	30.4	18.6	24.2	1.24
	S.D.	2.54	2.69	0.95	3.61	3.89	2.12	2.25	2.31	1.80
	95% C.I. ±	4.98	5.27	1.86	7.08	7.62	4.16	4.41	4.52	3.53
					120 - 129					
1	2-15-74	94.0	122.0	21.0	110.0	144.0	33.0	16.0	22.0	12.0
2	5-5-74	99.0	125.0	21.0	118.0	149.0	33.0	19.0	24.0	12.0
3	3-17-74	99.0	126.0	21.0	116.0	148.0	33.0	17.0	22.0	12.0
4	4-26-74	100.0	128.0	22.0	121.0	156.0	38.0	21.0	28.0	16.0
5	1-28-75	96.0	127.0	20.0	119.0	153.0	34.0	23.0	26.0	14.0
6	2-1-75	93.0	120.0	18.0	111.0	145.0	33.0	18.0	25.0	15.0
7	2-2-75	94.0	121.0	19.0	113.0	146.0	34.0	19.0	25.0	15.0
8	2-3-75	93.0	122.0	20.0	114.0	149.0	30.0	21.0	27.0	10.0
9	2-4-75	93.0	122.0	19.0	114.0	148.0	30.0	21.0	26.0	11.0
10	2-5-75	94.0	124.0	20.0	115.0	152.0	36.0	21.0	28.0	16.0
11	2-9-75	93.0	123,0	19.0	112.0	150.0	31.0	19.0	27.0	12.0
12	2-9-75	93.0	123.0	20.0	115.0	151.0	35.0	22.0	28.0	15.0
13	2-10-75	90.0	120.0	19.0	109.0	142.0	30.0	19.0	22.0	11.0
14	2-10-75	92.0	120.0	20.0	113.0	149.0	34.0	21.0	29.0	14.0
15	2-11-75	95.0	121.0	20.0	113.0	146.0	31.0	18.0	25.0	11.0
16	2-13-75	93.0	122.0	19.0	113.0	148.0	33.0	20.0	26.0	14.0
17	2-14-75	95.0	127.0	19.0	114.0	155.0	33.0	19.0	28.0	14.0
18	2-15-75	94.0	122.0	20.0	115.0	150.0	35.0	21.0	28.0	15.0

APPENDIX TABLE 1.--Growth per molt data for male Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt.

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	right chela	length	width	right chela	length	width	right chela
120 - 129 (continued)										
19	2-19-75	96.0	127.0	19.0	114.0	150.0	29.0	18.0	23.0	10.0
20	2-21-75	93.0	121.0	20.0	112.0	148.0	32.0	19.0	27.0	12.0
21	2-20-75	91.0	120.0	-	111.0	143.0	31.0	20.0	23.0	-
	$\bar{X}$	94.3	123.0	19.8	113.9	148.6	32.8	19.6	25.6	13.1
	S.D.	2.55	2.64	0.95	2.90	3.62	2.23	1.72	2.76	1.96
	95% C.I. ±	5.00	5.17	1.86	5.68	7.09	4.37	3.37	4.42	3.84
130 - 139										
1	4-24-74	105.0	137.0	-	120.0	156.0	-	15.0	19.0	-
2	2-4-75	100.0	130.0	30.0	118.0	153.0	42.0	18.0	23.0	12.0
	$\bar{X}$	102.5	133.5	30.0	119.0	154.5	42.0	16.5	21.0	12.0
	S.D.	3.54	4.94		1.41	2.12		2.12	2.82	
	95% C.I. ±		9.68			4.15			5.52	

APPENDIX TABLE 2 .--Growth per molt data for female Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt (* molt to maturity)

10 - 19

No.	Date of Molt	Premolt (mm) length	Premolt (mm) width	Premolt (mm) abdomen	Postmolt (mm) length	Postmolt (mm) width	Postmolt (mm) abdomen	Growth (mm) length	Growth (mm) width	Growth (mm) abdomen
1	3-7-76	16.0	18.8	5.7	20.1	25.1	8.1	4.1	6.3	2.4
2	3-7-76	15.2	18.2	5.2	19.2	24.4	8.0	4.0	6.2	2.8
3	3-7-76	15.3	18.0	5.4	19.0	24.2	7.6	3.7	6.2	2.2
4	3-15-76	15.9	19.3	5.7	20.4	25.5	8.3	4.5	6.2	2.6
5	3-15-76	15.0	18.3	5.3	19.4	24.1	7.7	4.4	5.8	2.4
6	3-18-76	11.1	13.2	3.5	14.5	17.7	5.0	3.4	4.5	1.5
7	3-23-76	14.4	17.9	5.1	19.0	23.7	7.3	4.6	5.8	2.2
8	3-23-76	15.6	19.3	5.2	20.7	25.9	8.2	5.1	6.6	3.0
9	3-30-76	16.1	18.6	5.9	19.5	24.8	7.9	3.4	6.2	2.0
10	4-25-76	14.5	17.6	4.9	19.0	23.9	7.4	4.5	6.3	2.5
11	5-10-76	10.4	12.3	3.5	12.9	15.7	4.3	2.5	3.4	0.8
	$\bar{X}$	14.5	17.4	5.03	18.5	23.1	7.3	4.01	5.77	2.21
	S.D.	1.94	2.37	0.81	2.47	3.30	1.33	0.72	0.96	0.61
	95% C.I. ±	3.8	4.6	1.6	4.8	6.5	2.6	1.4	1.2	1.2

20 - 29

1	3-7-76	16.5	20.2	6.2	21.3	27.0	9.4	4.8	6.8	3.2
2	3-12-76	17.6	20.9	6.3	22.0	27.6	9.4	4.4	6.3	3.1
	$\bar{X}$	17.1	20.5	6.3	21.7	27.3	9.4	4.6	6.6	3.2
	S.D.	0.77	0.49	0.07	0.49	0.42	0	0.28	0.35	0.07
	95% C.I. ±	1.5	0.96	0.13	0.96	0.82	0	0.54	0.68	0.13

APPENDIX TABLE 2.--Growth per molt data for female Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt (* molt to maturity)

30 - 39

No.	Date of Molt	Premolt (mm)			Postmolt (mm)			Growth (mm)		
		length	width	abdomen	length	width	abdomen	length	width	abdomen
1	4-28-74	30.0	38.0	15.0	38.0	49.0	21.0	8.0	11.0	6.0
2	3-21-76	28.3	35.7	13.4	36.5	47.0	19.4	8.2	11.3	6.0
3	3-30-76	30.6	39.3	14.0	38.8	51.1	19.7	8.2	11.8	5.7
4	3-15-77	30.0	39.0	15.0	38.0	49.0	20.0	8.0	10.0	5.0
5	11-15-77	30.1	39.5	14.4	42.0	52.2	22.2	11.9	12.7	7.8
6	11-16-77	29.4	36.6	13.9	37.8	48.8	20.0	8.4	12.2	6.1
	$\bar{X}$	29.7	38.0	14.2	38.5	49.5	20.3	8.7	11.5	6.1
	S.D.	0.79	1.56	0.64	1.86	1.84	1.04	1.53	0.95	0.92
	95% C.I. ±	1.54	3.05	1.25	3.64	3.60	2.03	2.99	1.86	1.80

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1	5-18-74	37.0	48.0	20.0	47.0	61.0	27.0	10.0	13.0	7.0
2	4-7-75	37.0	48.0	20.0	47.0	60.0	26.0	10.0	12.0	6.0
3	2-24-76	35.0	45.0	18.0	45.0	59.0	26.0	10.0	14.0	8.0
4	3-8-77	33.0	43.0	16.0	45.0	56.0	24.0	12.0	13.0	8.0
5	11-14-77	32.0	41.0	16.0	41.0	54.0	23.0	9.0	13.0	7.0
6	11-16-77	32.0	40.0	16.0	42.0	53.0	23.0	10.0	13.0	7.0
7	11-21-77	32.0	41.0	17.0	41.0	53.0	23.0	9.0	12.0	6.0
8	12-7-77	33.0	43.0	17.0	44.0	57.0	25.0	11.0	14.0	8.0
	$\bar{X}$	33.8	43.6	17.5	44.0	56.6	24.6	10.1	13.0	7.1
	S.D.	2.16	3.11	1.69	2.44	3.15	1.59	0.99	0.75	0.83
	95% C.I. ±	4.23	6.09	3.31	4.78	6.17	3.11	1.94	1.47	1.62

APPENDIX TABLE 2.--Growth per molt data for female Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt (* molt to maturity)

No.	Date of Molt	Premolt (mm)			Postmolt (mm)			Growth (mm)		
		length	width	abdomen	length	width	abdomen	length	width	abdomen
					50 - 59					
1	3-23-74	44.0	56.0	23.0	56.0	73.0	32.0	12.0	17.0	9.0
					60 - 69					
1*	5-26-74	53.0	68.0	30.0	64.0	81.0	54.0	11.0	13.0	24.0
2*	5-26-74	55.0	69.0	32.0	66.0	82.0	55.0	11.0	13.0	23.0
3*	1-5-75	51.0	66.0	-	65.0	84.0	-	14.0	18.0	-
4*	2-3-75	54.0	69.0	31.0	64.0	82.0	52.0	10.0	13.0	21.0
5	11-10-75	53.0	69.0	31.0	67.0	86.0	41.0	14.0	17.0	10.0
6	11-14-75	52.0	65.0	28.0	65.0	84.0	39.0	13.0	19.0	11.0
7	11-14-75	49.0	63.0	27.0	64.0	82.0	38.0	15.0	19.0	11.0
8	11-16-75	48.0	61.0	27.0	61.0	78.0	-	13.0	17.0	-
9	11-19-75	48.0	60.0	27.0	59.0	74.0	35.0	11.0	14.0	8.0
10	11-28-75	50.0	64.0	29.0	62.0	81.0	39.0	12.0	17.0	10.0
11	12-3-75	49.0	64.0	26.0	63.0	80.0	38.0	14.0	16.0	12.0
12	12-10-75	47.0	61.0	27.0	62.0	81.0	39.0	15.0	20.0	12.0
13	12-11-75	50.0	63.0	28.0	65.0	83.0	39.0	15.0	20.0	11.0
14	12-14-75	48.0	62.0	28.0	63.0	82.0	39.0	15.0	20.0	11.0
15	12-22-75	52.0	67.0	30.0	66.0	86.0	40.0	14.0	19.0	10.0
16	3-8-77	50.0	65.0	28.0	64.0	82.0	35.0	14.0	17.0	10.0
17	3-15-77	54.0	69.0	31.0	68.0	86.0	41.0	14.0	17.0	10.0
18	3-15-77	54.0	69.0	31.0	68.0	86.0	41.0	14.0	17.0	10.0

APPENDIX TABLE 2.--Growth per molt data for female Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt (* molt to maturity)

			Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.		Date of Molt	length	width	abdomen	length	width	abdomen	length	width	abdomen
All		$\bar{X}$	50.9	65.2	28.8	64.2	82.2	41.7	13.2	17.0	12.7
		S.D.	2.50	3.15	1.86	2.36	3.05	6.11	1.60	2.40	5.03
		95% C.I. ±	4.90	6.17	3.64	4.62	5.97	11.90	3.13	4.70	9.85
Remained	Juveniles	$\bar{X}$	50.3	64.4	28.4	64.1	82.2	39.0	13.8	17.7	10.5
		S.D.	2.33	3.08	1.69	2.64	3.44	1.63	1.19	1.76	1.05
		95% C.I. ±	4.57	6.03	3.31	5.17	6.74	3.19	2.33	3.44	2.06
Molted to	Maturity	$\bar{X}$	53.3	68.0	31.0	64.8	82.2	53.6	11.5	14.25	22.7
		S.D.	1.70	1.41	1.0	0.96	1.25	1.52	1.73	2.50	1.53
		95% C.I. ±	3.30	2.76	1.96	1.88	2.45	2.98	3.39	4.90	3.00

APPENDIX TABLE 2.--Growth per molt data for female Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt (* molt to maturity)

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No.	Date of Molt	Premolt (mm)			Postmolt (mm)			Growth (mm)		
		length	width	abdomen	length	width	abdomen	length	width	abdomen
1*	2-4-74	62.0	74.0	35.0	74.0	97.0	62.0	12.0	23.0	27.0
2*	2-13-74	61.0	79.0	35.0	69.0	90.0	55.0	8.0	11.0	20.0
3*	2-18-74	61.0	76.0	35.0	72.0	91.0	61.0	11.0	15.0	26.0
4*	5-4-74	55.0	72.0	32.0	65.0	84.0	54.0	10.0	12.0	22.0
5*	5-18-74	57.0	72.0	34.0	68.0	87.0	56.0	11.0	15.0	22.0
6*	5-26-74	60.0	77.0	36.0	68.0	90.0	59.0	8.0	13.0	23.0
7*	5-26-74	55.0	71.0	32.0	65.0	84.0	55.0	10.0	13.0	23.0
8*	6-4-74	60.0	75.0	35.0	70.0	89.0	58.0	10.0	14.0	23.0
9	12-11-74	55.0	71.0	32.0	67.0	87.0	41.0	12.0	16.0	9.0
10*	1-4-75	62.0	77.0	34.0	73.0	92.0	59.0	11.0	15.0	25.0
11*	1-10-75	58.0	74.0	33.0	70.0	90.0	57.0	12.0	16.0	24.0
12*	1-15-75	59.0	75.0	34.0	72.0	91.0	60.0	13.0	16.0	26.0
13*	2-7-75	56.0	73.0	35.0	68.0	88.0	60.0	12.0	15.0	25.0
14*	2-10-75	60.0	77.0	34.0	70.0	92.0	60.0	10.0	15.0	26.0
15*	2-26-75	57.0	74.0	33.0	67.0	88.0	57.0	10.0	14.0	24.0
16*	5-10-75	61.0	76.0	36.0	71.0	90.0	59.0	10.0	14.0	23.0
17*	6-4-75	61.0	78.0	37.0	70.0	91.0	63.0	9.0	13.0	26.0
18	11-16-75	57.0	76.0	32.0	73.0	92.0	42.0	16.0	16.0	10.0
19	11-19-75	57.0	73.0	33.0	71.0	91.0	44.0	14.0	18.0	11.0
20	11-24-75	55.0	70.0	30.0	69.0	88.0	42.0	14.0	18.0	12.0
21	12-11-75	56.0	72.0	32.0	70.0	92.0	44.0	14.0	20.0	12.0
22	1-13-76	56.0	71.0	32.0	73.0	93.0	45.0	17.0	22.0	13.0

APPENDIX TABLE 2.--Growth per molt data for female Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt (* molt to maturity)

70 - 79 (continued)

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	abdomen	length	width	abdomen	length	width	abdomen
23	1-16-76	56.0	72.0	32.0	71.0	90.0	43.0	15.0	18.0	11.0
24*	2-19-76	59.0	76.0	36.0	71.0	92.0	60.0	12.0	16.0	24.0
25*	2-23-76	62.0	78.0	35.0	73.0	93.0	60.0	11.0	15.0	25.0
26*	5-17-77	58.0	75.0	33.0	70.0	88.0	58.0	12.0	13.0	25.0
All	$\bar{X}$	58.3	74.3	33.7	70.0	90.0	54.3	11.6	15.6	20.6
	S.D.	2.46	2.53	1.71	2.41	2.81	7.37	2.27	2.85	6.11
	95% C.I. ±	4.82	4.95	3.35	4.72	5.50	14.44	4.44	5.58	11.97
Remained Juvenile	$\bar{X}$	56.0	72.1	31.9	70.8	90.4	43.0	14.8	18.2	11.1
	S.D.	0.82	1.95	0.90	2.15	2.22	1.41	1.62	2.13	1.35
	95% C.I. ±	1.61	3.82	1.76	4.21	4.35	2.76	3.18	4.17	2.65
Molted to Maturity	$\bar{X}$	59.2	75.2	34.4	69.8	89.84	58.6	10.6	14.6	24.2
	S.D.	2.32	2.22	1.39	2.53	2.94	2.43	1.38	2.45	1.77
	95% C.I. ±	4.55	4.35	2.72	4.96	5.76	4.76	2.70	4.80	3.47

APPENDIX TABLE 2.--Growth per molt data for female Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt (* molt to maturity)

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		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	abdomen	length	width	abdomen	length	width	abdomen
1*	2-8-74	65.0	84.0	38.0	75.0	97.0	61.0	10.0	13.0	23.0
2*	2-18-74	69.0	88.0	43.0	81.0	104.0	69.0	12.0	16.0	26.0
3*	2-20-74	68.0	87.0	41.0	79.0	103.0	65.0	11.0	16.0	24.0
4*	2-5-75	61.0	80.0	36.0	71.0	93.0	60.0	10.0	13.0	24.0
5*	2-5-75	68.0	87.0	40.0	79.0	101.0	65.0	11.0	14.0	25.0
6*	2-10-75	61.0	80.0	37.0	73.0	95.0	61.0	12.0	15.0	24.0
7*	3-9-75	68.0	86.0	42.0	78.0	102.0	68.0	10.0	16.0	26.0
8*	3-18-75	65.0	83.0	40.0	76.0	97.0	64.0	11.0	14.0	24.0
9*	4-11-75	63.0	80.0	36.0	74.0	94.0	59.0	11.0	14.0	23.0
10*	4-28-75	67.0	86.0	41.0	77.0	101.0	66.0	10.0	15.0	25.0
11*	6-8-75	64.0	80.0	39.0	73.0	96.0	64.0	9.0	16.0	25.0
12*	2-6-76	63.0	80.0	36.0	74.0	94.0	60.0	11.0	14.0	24.0
13*	2-23-76	67.0	85.0	41.0	80.0	102.0	67.0	13.0	17.0	26.0
14*	2-22-76	61.0	80.0	38.0	73.0	94.0	63.0	12.0	14.0	25.0
15*	2-22-76	65.0	86.0	43.0	76.0	99.0	62.0	11.0	13.0	19.0
16*	3-3-76	68.0	87.0	41.0	78.0	99.0	63.0	10.0	12.0	22,0
17*	3-7-76	68.0	89.0	41.0	78.0	100.0	62.0	10.0	11.0	21.0
18*	3-17-76	68.0	86.0	42.0	78.0	99.0	67.0	10.0	13.0	25.0
19*	3-17-76	68.0	88.0	42.0	79.0	102.0	68.0	11.0	14.0	26.0
20*	12-27-76	69.0	80.0	37.0	74.0	94.0	60.0	5.0	14.0	23.0
	$\bar{X}$	65.8	84.1	39.7	76.3	98.3	63.7	10.5	14.2	24.0
	S.D.	2.78	3.35	2.39	2.79	3.52	3.08	1.61	1.50	1.81
	95% C.I. ±	5.45	6.56	4.68	5.47	6.89	6.03	3.16	2.94	3.55

APPENDIX TABLE 2.--Growth per molt data for female Tanner crab, *Chionoecetes bairdi*, held in ocean pens at Kodiak, Alaska. Observations grouped by 10 mm premolt carapace width intervals by date of molt (* molt to maturity)

90 - 99

		Premolt (mm)			Postmolt (mm)			Growth (mm)		
No.	Date of Molt	length	width	abdomen	length	width	abdomen	length	width	abdomen
1*	2-8-74	70.0	91.0	39.0	81.0	105.0	64.0	11.0	14.0	25.0
2*	3-4-74	69.0	91.0	40.0	78.0	102.0	63.0	9.0	11.0	23.0
3*	5-7-74	73.0	93.0	42.0	84.0	106.0	64.0	11.0	13.0	22.0
4*	4-9-75	75.0	92.0	44.0	87.0	107.0	69.0	12.0	15.0	25.0
5*	4-15-75	72.0	92.0	44.0	84.0	108.0	71.0	12.0	16.0	27.0
6*	6-9-75	72.0	92.0	45.0	84.0	107.0	75.0	12.0	15.0	30.0
	$\bar{X}$	71.8	91.8	42.3	83.0	105.8	67.6	11.1	14.0	25.3
	S.D.	2.13	0.75	2.42	3.09	2.13	4.80	1.16	1.78	2.87
	95% C.I. ±	4.17	1.47	4.74	6.05	4.17	9.4	2.27	3.48	5.62